BACKYARD FARMING

Make your home a homestead

KEEPING HONEY BEES

"EXPERT ADVICE MADE EASY"

Kim Pezza

hatherleigh

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Backyard Farming: Keeping Honey Bees

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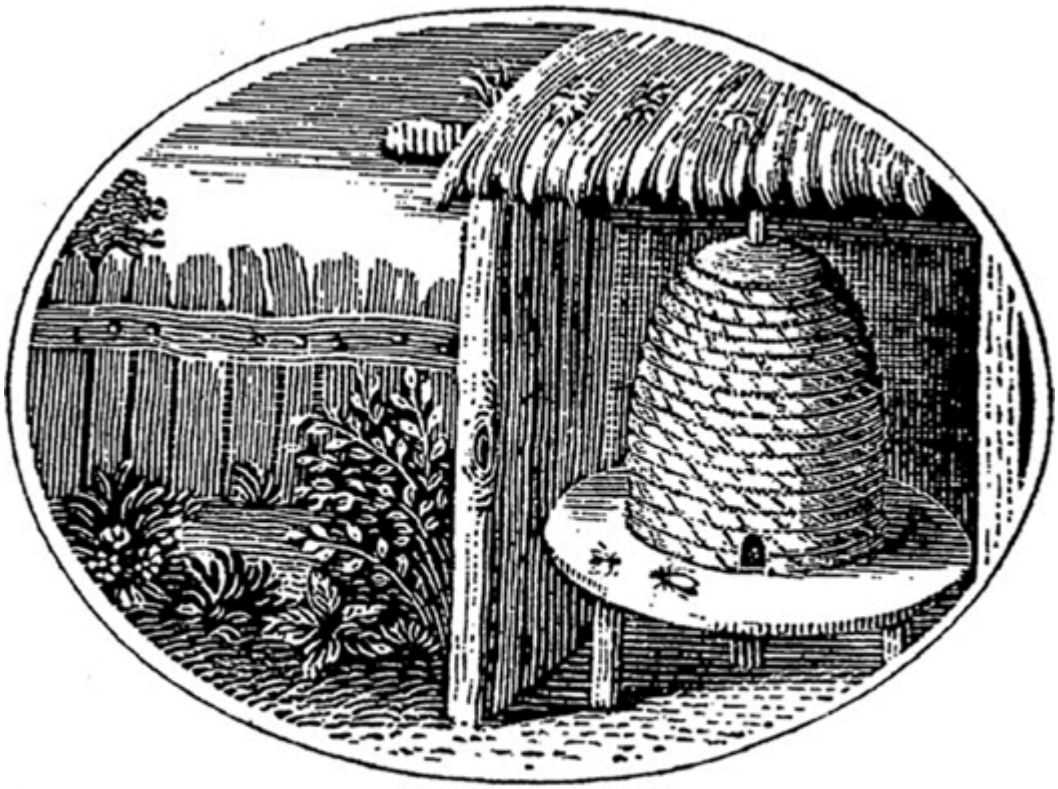


INTRODUCTION

The world of beekeeping is one full of mystery and intrigue for the common man. As they watch the beekeeper, carefully moving among their hives in their full protective suits, gathering honey from the unique little insects that make it, many people wonder what it must be like to keep bees themselves.

Also, now, with issues like colony collapse posing a major survival problem to the honeybee's world, more and more backyard farmers and homesteaders are becoming interested in beekeeping. Yet how do you know if beekeeping is really for you?

Adding hives and honeybees to your backyard farm requires a little more time, effort, and investment than planting a garden or raising chickens. Local restrictions and space requirements are even more important to consider. By deciding to keep honeybees, you are making a decision to install and maintain a small world run by your bees and watched over by you. If done correctly, however, keeping bees can be an enjoyable and incredibly rewarding experience.

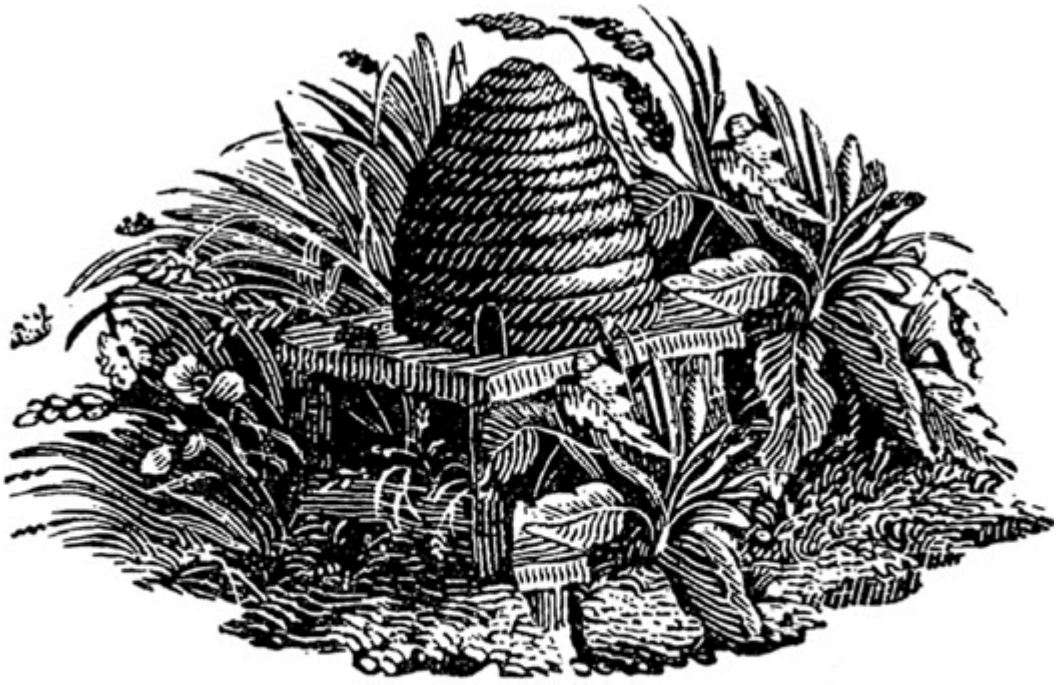
Along with helpful hints and expert tips, this book touches on the basics of beekeeping: from obtaining bees and what the different varieties available to new beekeepers are to choosing the right environment for producing the right types of honey. In clear, easy-to-understand language, this book helps to teach you what to expect as a beekeeper, the pros and cons of the trade, and how the ways in which the bees are kept affect almost every stage of their lives.

Backyard Farming: Keeping Honey Bees will be an excellent go-to source for those who may be considering obtaining their own hives, but are not quite sure whether it is for them. With this book written with these excited new beekeepers in mind, even the most novice

readers will find themselves ready to add beekeeping to their backyard farms.

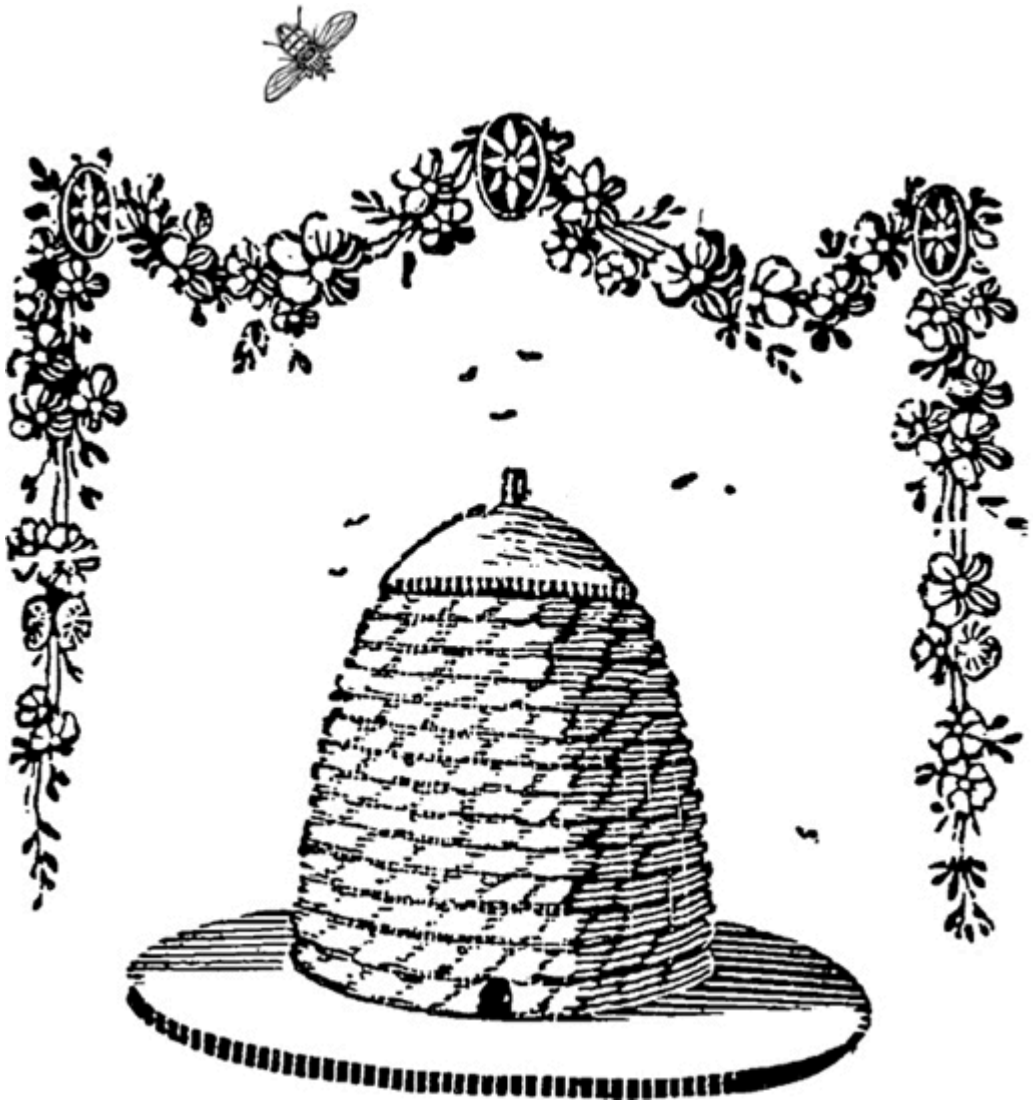
Backyard Farming: Keeping Honey Bees is meant to be a source for those who are considering a start in the world of bees. Laying out the basics simply and clearly without a lot of complicated, in-depth information, it will give potential new beekeepers an idea of what they can expect when (or if) they decide to have a hive of their own or if it is a hobby or potential business that they even want to continue to pursue.

So sit back with your favorite beverage (perhaps with a little honey?) and begin your adventure with honeybees, honey, and all the magic that beekeepers cherish about their little charges.



MEET THE EXPERT

Kim Pezza grew up among orchards and dairy and beef farms having lived most of her life in the Finger Lakes region of New York State. She has raised pigs, poultry and game birds, rabbits and goats, and is experienced in growing herbs and vegetables. In her spare time, Kim also teaches workshops in a variety of areas, from art and simple computers for seniors, to making herb butter, oils, and vinegars. She continues to learn new techniques and skills and is currently looking to turn her grandparents' 1800s farm into a small, working homestead.



CHAPTER 1

A SHORT HISTORY OF THE BEE AND ITS MAGIC

It is a good bet that there are probably only a few people in the United States—or anywhere else for that matter—who have never seen a honeybee at least once in their lives. It is also well known how important these busy, buzzy little girls (yes, *girls*, but we'll cover that later) are to our own food supply. It has even entered the public consciousness that honeybees are now facing peril on a worldwide scale. However, what isn't well known is just how long and storied a history the honeybee has, dating back millions of years (around 60 million years in fact).

There is even evidence to suggest that a bee species native to North America lived approximately 14 million years ago, its existence proven through a worker-bee fossil found in Nevada in 2009. Unfortunately, those bees died out long ago, and the honeybee did not reappear on the North American continent again until about 1622, when European settlers brought their hives with them. Like many other species of wildlife that originated with the European settlers, it is thought that some bees left their captivity and set up shop in the untamed wilderness of North America.

Yet it isn't just prehistoric North America that has played host to honeybees. A 19 million-year-old giant honeybee fossil was found

on Iki Island, Japan, and there is evidence of beekeeping going as far back as ancient Egypt, Greece, and Spain. Some of this evidence even includes excavations of preserved hives. In fact, the Egyptian *Papyrus Ebers*, the oldest known book of medicine, includes a number of recipes that utilize honey for its curative effects.

Despite being one of the oldest agricultural practices known to man, beekeeping continues to find popularity today, not only in rural fields, farms, and backyards, but in the urban landscape as well. Small city lots, suburban backyards, and building rooftops have all become home to hives, not only in the United States, but in other areas of the world as well. Ironically, as enthusiasm for bees and beekeeping continues to grow, the world's bee population continues to shrink. The decline of the honeybee population in the United States alone has resulted in a 50 percent decrease over the last fifty years. People are not only becoming involved in the plight of the honeybee and what humans stand to lose with the loss of the bees, but are getting involved with beekeeping themselves. By learning to keep bees, you are joining a proud tradition, which has existed and thrived for thousands of years, at one of the most important times in its history.

CHAPTER 2

WHAT DISTINGUISHES A HONEYBEE?

A bee is a bee, and all bees basically look alike, act alike, live alike, and make the same honey the same way for harvesting, right?

Wrong.

In general, there are over 20,000 species of bees in existence. Scientifically, the honeybee species is that of Apis. The class is Insecta, the order is Hymenoptera, and the family is Apidae. However, out of all of those, only seven species are recognized as honeybees.

They are:

- *Apis mellifera* (Western)
- *Apis nigrocincta*
- *Apis koschevnikovi*
- *Apis cerana* (Eastern Asiatic)
- *Apis andreniformig* (Black Dwarf)
- *Apis dorsata* (Giant Honeybee)
- *Apis florea* (Red Dwarf)

Along with the recognized species, there are 44 subspecies.

Common Bees in the United States

Although there are no longer any species of honeybee that are native to North America, there are six types of bees, imported throughout the decades (if not centuries), that are most commonly available in the United States.

They are (in no particular order of popularity):

- Italian Bee
- German Bee
- Carniolan Bee
- Caucasian Bee
- Buckfast Bee
- Russian Bee

A quick review of each of the six types of common honeybees in the United States is as follows:

Italian Bee: The Italian bee was first imported to the United States in 1859. For the beekeeper, the Italian bee has a gentle temperament, which makes handling it much easier. They are excellent honey producers, and their tendency to swarm is quite low, meaning that it is less likely that a keeper will have his bees leaving the hive in search of a new home. (The full story on swarming and why bees do it will be discussed later in Chapter 6.)

An Italian worker bee. Photo courtesy of Wikimedia Commons.

German Bee: Also known as the European Dark, the German bee is hardy in winter, a good flier in the cold, and is, therefore, a great choice for cold climates. Like the Italian bee, they have low swarm tendencies. The worker and queen can have good longevity if cared for properly. It should be noted, however, that hybrids/crossbreeds of the German bee may have aggressive tendencies, which could make handling the bees more difficult for the beekeeper.

Carniolan Bee: The Carniolan is a subspecies of the Western honeybee (Apis mellifera). Although this species is prone to swarming, can have problems in the heat, and the queen may be difficult to locate within the hive, the Carniolan is still a favorite due to the fact that, although it will defend itself against other insects and insect intruders, it remains gentle to its handlers—even the queen remains gentle.

The Carniolan bee is also resistant to (at least some) diseases and parasites. They can be kept in populated areas (great for urban beekeepers), and adapt quickly to changes in the environment. They also do well in regions with long winters.

A Carniolan bee. Photo courtesy of Wikimedia Commons.

Caucasian Bee: Also a subspecies of the Western honeybee, the Caucasian is a gentle and calm bee, with strong colonies. However, they are not a good choice for those keepers in northern climates, as they do not winter well. The Caucasian may also drift away from a hive entered by a robber bee. (Robber bees will be covered later in Chapter 10, but it is almost exactly what it sounds like: a bee that steals from other hives.)

Buckfast Bee: The Buckfast bee is a crossbreed (in anything that I have found, it just states that this breed is a cross of many breeds, but, so far, nothing specific) that takes its name from Buckfast Abbey in Devon, the United Kingdom, from whence it originated. It is popular among beekeepers due to the fact that they are gentle, good tempered, and calm, with low sting tendencies. They have a keen sense of smell, are hardy in the winter, and are good honey producers.

A Buckfast bee. Photo courtesy of Marc Andrighetti.

Russian Bee: The Russian bee originated in the Primorsky Krai region of Russia. They were imported into the United States by the USDA Honeybee Breeding, Genetics, and Physiology Lab in 1997. Although the species endures winters well, is resistant to some parasite mites, and is comprised of good honey producers, the Russian bee does tend to swarm, and its numbers tend to explode.

A Russian bee. Photo courtesy of Robert Engelhart.

Living

The honeybee is a social bee, meaning that it lives in an organized structure, working and living in constant cooperation with others. In contrast, the solitary bee has no social structure and will live and hunt alone.

It should be noted that it is precisely this social colony structure that allows the honeybee to survive for years, as it has the ability to huddle and eat its honey to survive the winter.

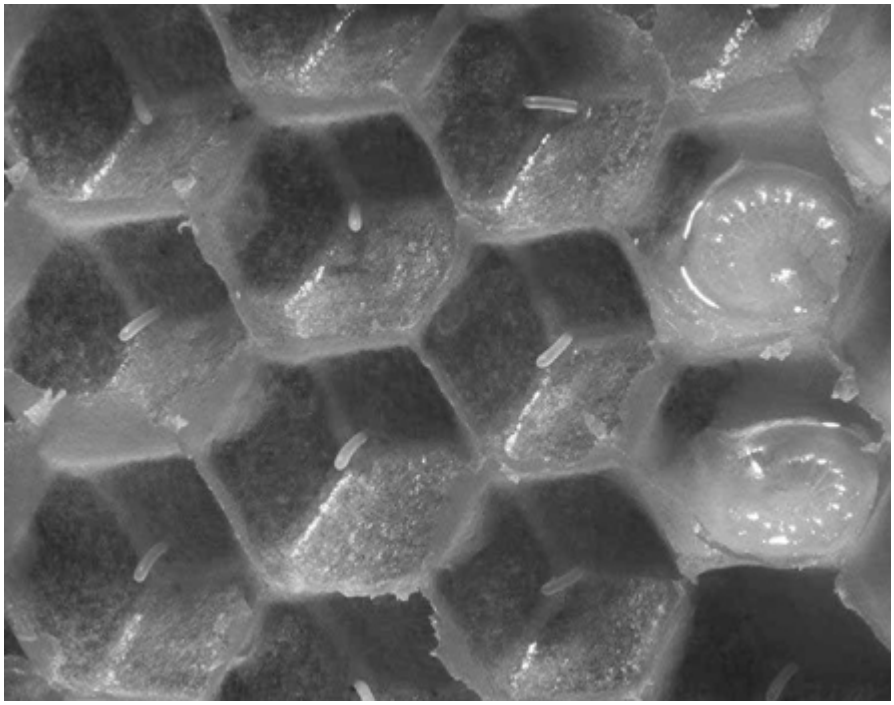
However, it would be inaccurate to assume that it is only the honeybee that produces honey. Solitary bees and the bumblebee are good examples of non-honeybee honey producers. Yet, although these bees will both produce and store honey, they do not produce anywhere near the quantity that honeybees do, making them unfit to use for honey harvesting.

The size of the typical honeybee colony can average 60,000 residents. This will break down into about half of the bees tending to the young and assisting the queen, while the rest go out and forage for nectar and pollen, both being food for the bees (though the bees will also need water). Along with the queen, you also have the worker and drone. All workers are female and work the hive in various roles. All drones are male and are only breeders. These roles will be covered in more detail a bit later.

Stages of the Bee

As do other insects, the honeybee goes through developmental, or life, stages. These stages are:

- Egg
- Larval
- Pupal
- Metamorphosis into Adult Bee



Eggs and larvae in their combs. Photo courtesy of Waugsberg.

Much like the butterfly, the honeybee will go through each one of these stages, eventually becoming the functioning worker, drone, or, in some cases, new queen.

The fertilized egg of the honeybee is laid within the wax chambers, or cell, of a honeycomb. The honeycomb that is used for laying eggs is called the brooder comb. Looking like little grains of rice, each egg stands on and within its own small cell. Within only three days of being laid, the eggs will hatch, beginning the next stage of development, which is the larval. The larva looks like a little white worm. At this stage, the larva does not have legs or eyes.

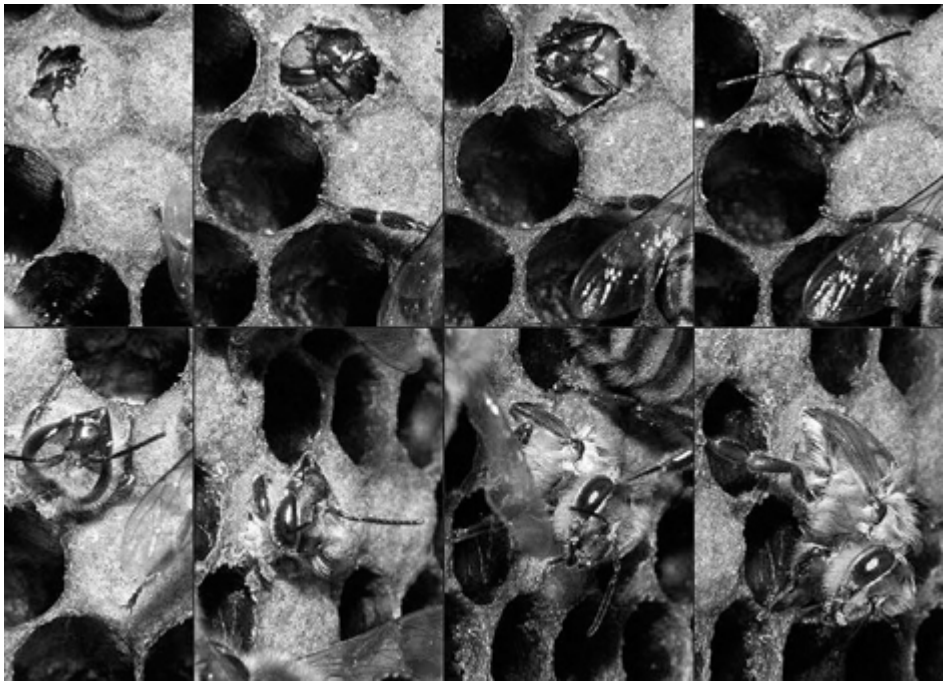
For the first few days, the larva will live on a diet of royal jelly, a substance rich in protein, vitamins, fats, and minerals. Starting at day three, the larvae's diet will be altered, according to the roles that it will play in the hive or colony. Those destined to be workers and drones will be switched to a honey, pollen, and water diet. Those that have the potential to become queens will continue on an exclusive diet of royal jelly. The larva will have five moltings during this period. Be they worker, drone, or queen, the care given to the

larva by the workers is nonstop, providing it with at least ten thousand meals.

A drone pupa. Photo courtesy of Eugene Aufnahme.

After a period of time (five and a half days for queen larvae, six days for worker larvae, and six and a half days for drone larvae), they will move on to the next stage: the pupal stage.

At the pupal stage, the larva goes through a complete body overhaul, totally changing its structure. As tissues reorganize, the body will change into the more familiar form of the bee. Normally this takes seven and a half days for a queen, fourteen and a half days for a drone, and twelve days for a worker. The final stage is the metamorphosis into the adult bee, thus completing the cycle within a 21-day time period.



New bees emerging from their combs. Photo courtesy of Waugsberg.

Bee Anatomy

The anatomy of the adult bee is broken into three main parts:

- Head
- Thorax
- Abdomen

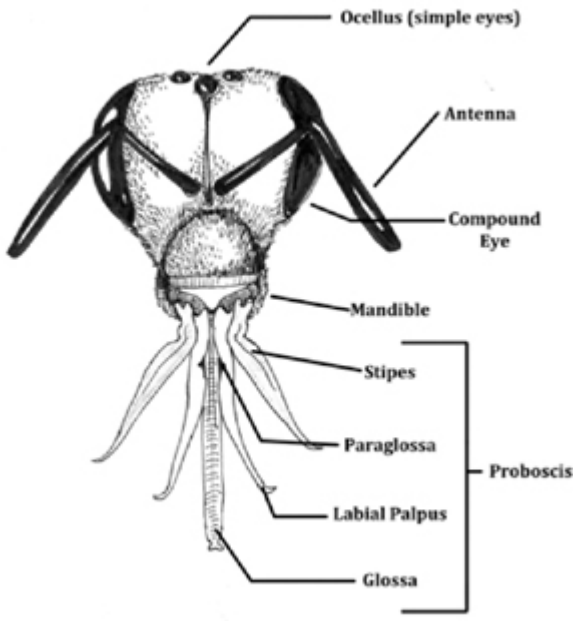
The Head

The head consists of the antennae, the eyes, the mandibles, and the proboscis. The eyes consist of two compound eyes as well as three simple eyes.

The compound eyes are basically light-sensitive cells that can understand color, light, and direction. The three simple eyes (or ocelli) are arranged in a triangle and determine light.

Antennae are used for sense of smell through hairs that cover them and, sometimes, are even able to figure out the direction that

an odor is coming from. The antennae can also measure flight speed, as well as information about taste, temperature, and humidity. The antennae are also sensitive to vibration.



The parts of a bee's head. Illustration by Ariel Delacriox Dax.

The mandibles are, in basic terms, very strong jaws. They are used for eating pollen, cutting and shaping wax, feeding the young as well as the queen, cleaning the hive, grooming, and fighting.

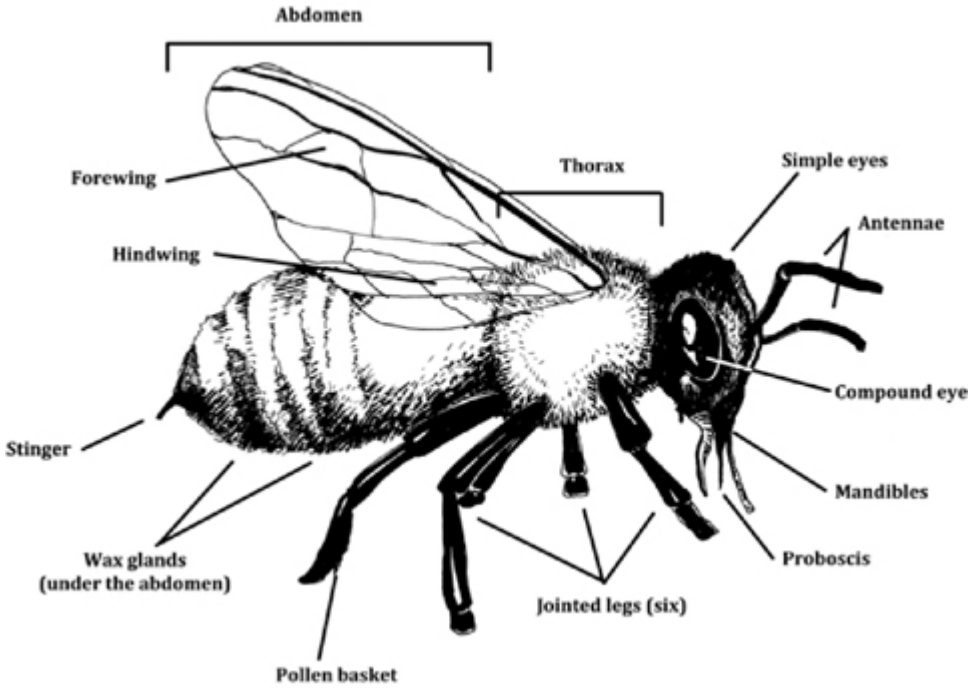
The proboscis is the tubular part of the mouth used for feeding. It is also referred to as the glossa. Basically, it is like a tongue, but the bee will sip water nectar and honey through it as we would use a straw.

The Thorax

The thorax consists of the wings, legs, and movement muscles. The wings are in two parts: the forewing and hind wing. The forewing is the larger of the wings. It is used mainly for flight, but can also be used with the hind wing for cooling. The hind wing is used for flight

and cooling the hive. The forewing and the hind wing may hook together to work in unison.

There are six legs that provide movement and the ability to manipulate and carry pollen. One set is structured to clean the antennae. Each front leg has two parts, with a notched spot that wraps around the antennae and pulls it through the notch, removing dust and other particulates that could interfere with the sensitivity of the antennae. This is called the antennae cleaner.



The anatomy of a honeybee. Illustration by Ariel Delacriox Dax.

The middle leg, although not having a particular special purpose, helps to collect pollen off of the bee's body for deposit into the pollen basket.

Bee with filled pollen bucket. Photo courtesy of Wikimedia Commons.

The hind legs are home to the pollen baskets. The pollen basket is a small cavity surrounded by small hairs. The pollen goes into these hairs, getting pressed in and held in place between the small hairs. From there, the pollen goes to the pollen comb (also located on the hind leg), where it is pressed, compacted, and then transferred to the outside of the hind leg, where the pollen is secured by a single hair.

Each leg has a foot, and each foot a claw. The claw allows the honeybee to hold onto rough surfaces.

The Abdomen

The abdomen is in seven segments. In segments four through seven, wax is created and secreted. In the queen bee, the abdomen also contains the female reproduction organs, and, in the drone, the male reproduction organs.

The stinger is also found in the abdomen. The workers and the queen have stingers, which they use for defense; however, once a worker bee stings, it will die. This is due to the fact that, once the

stinger, which is barbed, tries to pull away, the abdomen ruptures, causing the death of the bee.

Now that some of the basics have been discussed about the honeybee, let us explore a bit further as to some of the things that a potential beekeeper needs to know as you consider your future with the honeybee.

A Few More Facts on the Honeybee

As insects go, the honeybee is an interesting one, and one that has lots more little secrets surrounding them. Besides what has already been discussed, a few more tidbits of information are worth noting, if for no other reason than to show more of what these little powerhouses have behind them.

If you have ever seen a honeybee fly, you may have noticed that the wings are going so fast that you can hardly see them. This is because the honeybee's wings beat over eleven thousand times per minute. Also, that "buzz" that you hear is due to the flap of its wings.

While we are discussing wings, the honeybee flies at an average speed of between 12 and 15 miles per hour, usually keeping within a one to five-mile radius of its hive. (The closer the bee can stay to the hive, the better it likes it.)

Honeybees perform best between temperatures of 62˚F and 105˚F. However, they will slow down in winds of 15 miles per hour, and they will stop altogether in 25 mile-per-hour winds.

Vision wise, honeybees can see every color that a human being can see, with the exception of red, and is the only insect that produces food fit for human consumption.

CHAPTER 3

HIERARCHY OF BEES

Like all societies, honeybees have a definite social structure. From the queen, without whom the colony would not exist, to the drone who can be literally quite dispensable, the honeybee has a very interesting social ladder. So, for those of you who are not familiar with their social structure and way of life, once you have learned more, you may never look at honeybees the same again.

The honeybee has what would be considered an actual, functioning class system, where everyone knows its place, status, and job straight from the date it hatches. In a working colony or hive, there can be between 50,000 and 60,000 of which 99 percent of the hive will be female.

Worker honey bee Queen honey bee Drone honey bee

The three types of bees. Illustration by Ariel Delacriox Dax.

There are three “classes” within all honeybee colonies or hives:

- Queen
- Worker
- Drone

The Queen

There is only one queen in any hive or colony, and her one and only job is to produce eggs in order to populate the colony. She is the only fertile female within the colony. The queen is the largest bee in the colony. Her life span is up to five years, with approximately three of those years being productive (although some queens may need to be replaced sooner).

On her maiden flight, the queen will leave the hive, at which time drones will fertilize her. Although this will be her only mating, the process lasts several days, during which she will store the sperm within her body. The drones that fertilize her may not necessarily be from her hive or colony. She will then return to the hive, after which she will remain indoors for the rest of her life. (The only other time that the queen may leave is if the hive becomes overcrowded. If that happens, she may lead a swarm to a new location.)

The queen will begin her job of populating the hive as soon as she returns. She will average 1,000 to 1,500 eggs per day, with approximately 200,000 being laid in her lifetime. At some point, the queen will become infertile or perhaps even sick. When this happens, she is then replaced in a process called “supersedure.” While beekeepers may do this themselves, it is equally viable for the colony itself to create a new queen to take over for the old.

Yet how can a colony actually create a queen? It all begins at the larval stage. The workers will first create queen cups. Queen cups are larger than the regular cells/cups, and they are vertical instead

of horizontal. The existing queen will lay eggs within the cells, just as she would in the others. Unlike the others, though, the larvae that could be queens will be fed a diet made up entirely of royal jelly.

Royal jelly is secreted from the glands in the head of the worker bee, which, in this case, is the nurse bee. The jelly is rich in protein, vitamins, fats, and minerals. For the first three days of the larva's life, it is fed a diet strictly of royal jelly. After the third day, only the larva that is to be queen will continue on this exclusive diet, doing so during the entire larval stage.

A queen bee surrounded by drones. Photo courtesy of Wikimedia Commons.

Hatching time for the queen larva is 16 days. Although there are multiple queen larvae, it is the one that hatches first that becomes queen. Basically, it is all in the luck of the hatching. Once the new queen hatches, she will then "eliminate the competition" by going to each queen larva's cell and stinging the occupants to death. Then, if the old queen is still in the hive, she will meet the same fate. It

should also be noted that a queen may safely (safely for her, anyway) sting multiple times; as her stinger is not barbed, it will not remain in the victim, nor will it pull away from her abdomen as she withdraws.

However, it can happen that the workers will kill the old queen before the new one can. “Cuddle death” is when the workers surround and press their bodies against the queen until she gets so overheated that she dies.

On a less solemn note, do not forget that a new queen does not always spell doom for the old queen. A hive may simply be lacking its queen because she left with a swarm to find a new residence.

Once the new queen has taken her place in the colony, the maiden-flight fertilization ritual begins again, and the entire cycle starts over.

The Workers

The next rung down on the caste ladder is the worker bee. When the term busy as a bee was coined, it was with the worker honeybee in mind.

Although they start out essentially much as the queen does (which ends at day three), when the larvae are taken off of the royal-jelly diet, they instead are fed a combination of honey and pollen, sometimes called “bee bread,” which they will subsist on for the rest of their lives.

Soon after leaving their cocoon, the worker bees begin their job (remember that all the workers are female). For the first four days, however, the newly hatched workers will be cleaned and fed by the nurse bees until their bodies harden and their glands begin producing wax for combs.

The life span of the worker bee is about 40 days. However, as discussed earlier, in the wintertime, particularly in areas where temperatures are cold enough to slow the bees down, the worker may live a bit longer.

The life of the worker bee, in addition to being rather short, is not a particularly easy one. They live their lives in cycles. For the first 17 days of their productive lives (counting the first four days of their lives, during which they are completing their maturation), the worker bees will feed the larvae, process honey, manipulate wax, air-condition the hive when needed, and provide guard duty, amid a number of other jobs that need to be done for the colony or hive to survive.

The remaining days of their lives will be spent gathering pollen, nectar, and water. At the end of their life span, the workers simply leave the hive and go to die. This final journey of the cycle lasts approximately 20 days. The final 20 days include their gathering time.

The worker bees will attend to the larvae, the queen, and even the drones. Yet their work does not end there. In Chapter 4, we discuss the roles of the scout and the forager. However, the colony has many, many more jobs needing to be done. Let us look at some of the other work that goes on in the hive, keeping in mind that the worker bees can have more than one job during their lifetime.

A worker's job will usually change with its age, with each job having workers in the same approximate age range.

Nurse bees are the youngest of the matured workers. They will feed and care for the larvae and the queen, as well as feed the drones.

Sometimes, water needs to be brought to the hive to cool it down. It is the job of the water carriers to find and bring water back to the hive, carrying the water the same way as they do nectar. Once they find a good source, they will continue to use it for as long as they can.

After the water is brought back to the hive, the carriers will then sprinkle water on the fanning bees' backs and/or throughout the hive. As the fanning bees fan their wings, the water will add extra cooling to the hive. This is usually practiced only when the hive is in danger of overheating. It is basically natural air-conditioning.

The fanning bees are those workers whose job it is to keep the hive cool through the repeated fanning of their wings. Working like

a living air conditioner, they are very important to the hive, especially in the hot weather. If the hive overheats, it can kill the colony. Although, when most bees die, they are outside of the hive, some will pass inside, as will some larvae.

As honeybees are very clean and tidy, it will fall to the mortuary bees to take care of the problem. Just as the name suggests, the mortuary bees take care of the remains of the dead larvae and bees that have died within the hive. It is up to them to remove the bodies and deposit them outside of the hive. Not only is this part of the bees' cleanliness routine, it can also free cells and help prevent disease when the foragers return with their nectar. Some of the workers within the hive will then take the nectar that the foragers have collected and begin the honey-making process. Workers are also responsible for cleaning the comb cells, as well as opening or sealing them as necessary.

Also, as we have discussed before, it is up to the workers to perform guard duty at the hive. Woe betides any poor trespasser, as these girls can pack quite a punch.

As you can see, the lives of the worker bees are hard, but predictable, as they work themselves quite literally to death.

Yet, on the other hand, workers can have quite a bit of a say in the hive as well. It is usually the worker that decides if it is time to swarm, although sometimes, as we have discussed before, a queen will also make that decision. It is also the workers that make the decision as to when it is time for any leftover drones to leave the hive for good and to throw them out. Finally, many times, it is the workers that decide when and if the queen needs replacing, to the point of sometimes killing her themselves, if need be, while creating the new queen to replace her.

The worker bee is the most fascinating and hard-working occupant of the hive. It can also be the most ruthless. As important as the queen is to populating the colony, none of it could function without the workers.

The Drones

At first blush, it seems like the drone has it pretty easy in the hive. After all, it is fed by the nurse bees, and its one and only job is to go out and fertilize any queen that it can find. In truth, though, it is the drone that really gets the short straw in the caste system of the bees.

In appearance, the drone is larger than the worker bee, yet smaller than the queen. Its eyes are twice the size of the workers and the queen, but, unlike them, it is unable to sting, as it lacks a stinger.

Drones are fed by the workers (usually the nurses) until they are ready to mate. Also, although their main reason for existing is to fertilize a queen, once they do mate, the drones will die. This is due to the fact that the drone and queen will meet in midair, and, when it does fertilize the queen, its genitalia ends up quite literally ripped from its body.

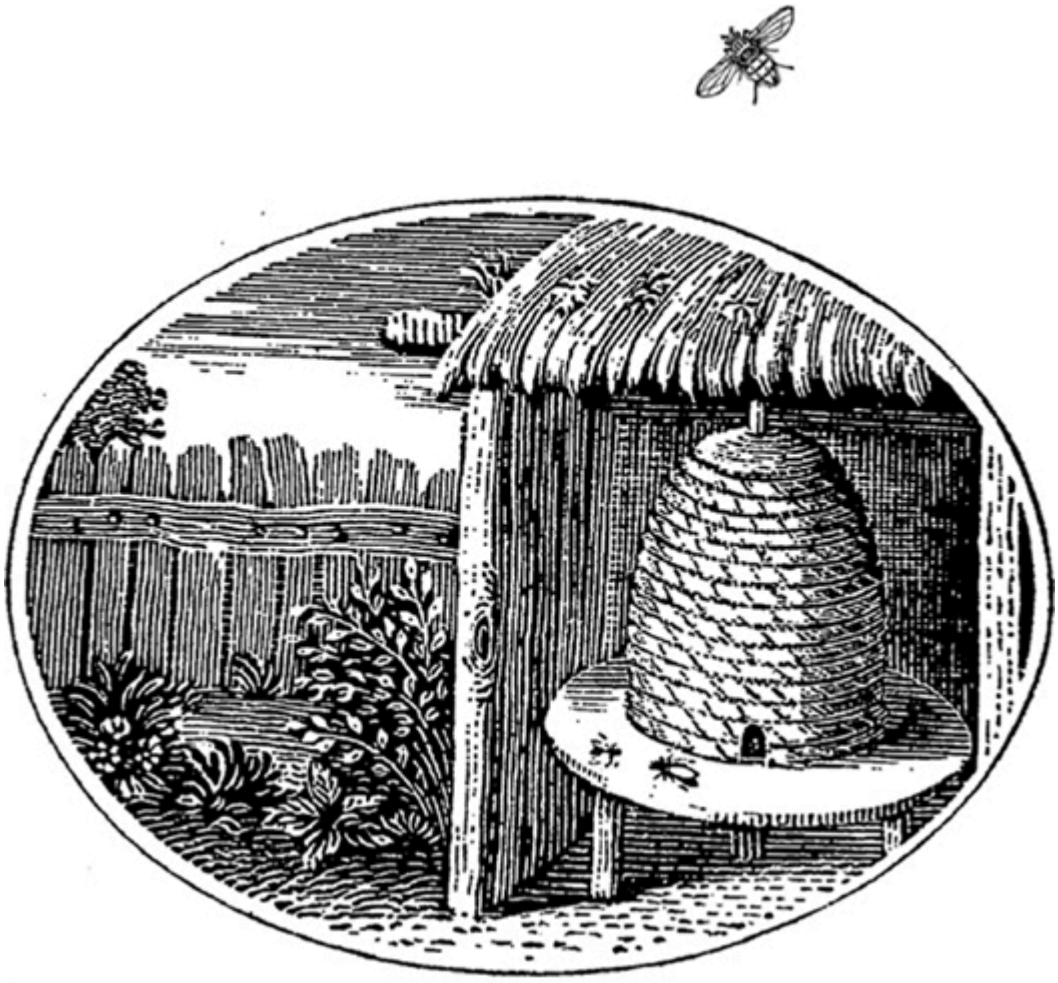
Drones and worker bees (drones in front with larger eyes). Photo courtesy of Wikimedia Commons.

If that is not bad enough for the poor drones, those that are still alive will most likely be kicked out of the hive in areas having harsh winter weather (also, they will be removed if the hive is running

into other hard times in regard to nutrition) and left on their own to starve. This is done to be sure that there is enough stored food to keep the larvae, workers, and queen going during hard times. As the drones are considered replaceable and not as important to the colony, they are sent away for the good of the hive.

As you can see from this brief account, in the honeybee hive, everyone has its place and job. There is no room for slackers, and those that do not work for and on behalf of the survival of the hive are quickly taken care of. It is a very strange kind of existence to the human mind, with one side being organized to the point of fascinating, while the other side is brutal and unforgiving.

It is all part of the magic of the honeybee.



CHAPTER 4

EASE OF KEEPING

One of the first things you may need to think about when considering beekeeping is how easy they would be to keep. Do they need constant care? What are the disease risks for the bees? Will I have predator problems? What about weather and seasonal changes? Housing is another issue the potential beekeeper will have questions about; however, this will be covered in Chapter 6.

The truth is that honeybees are really no more complicated to keep than most other livestock. Feeding, disease and disease prevention, protection from predators, and general upkeep through the seasons and all types of weather are all concerns that apply to honeybees as much as cattle or fowl. Every animal or bird on the homestead or backyard farm will have some sort of work involved or idiosyncrasy to account for. Yet, to many, the world of the honeybee seems so mysterious and magical that they feel there *must* be some difficult secret involved in learning how to raise these little girls (and boys—what few there are).

As with all things, the trick is to take things a step at a time. The first issue we will cover is that of feeding honeybees.

Feeding the Hive

Honeybees eat nectar and pollen, and, of course, they drink water. In the wintertime, in regions where hives are unable to forage for themselves, they will survive on their stored honey and pollen. In addition to their own natural stockpiling, keepers may also provide supplemental nourishment both inside and outside of the hive. Depending on the climate you live in and are keeping your bees in, they may hunt seasonally, remaining bundled up in the hive in the winter, or they may hunt for most of the year.

In the world of the honeybee, it is the job of the worker bees to feed the hive. Those who "handle" the food detail are known as "scouts" and "foragers."

In the hive, 25 percent of the worker bees are "scouts." The primary job of the scout is to find various food locations. Once the scouts have located viable food sources for the hive, they will return to base to inform the foragers as to where to find these food sources. The foragers are the bees that will actually go out and bring the food back to the hive. They do so through the use of odor, direction, and distance.

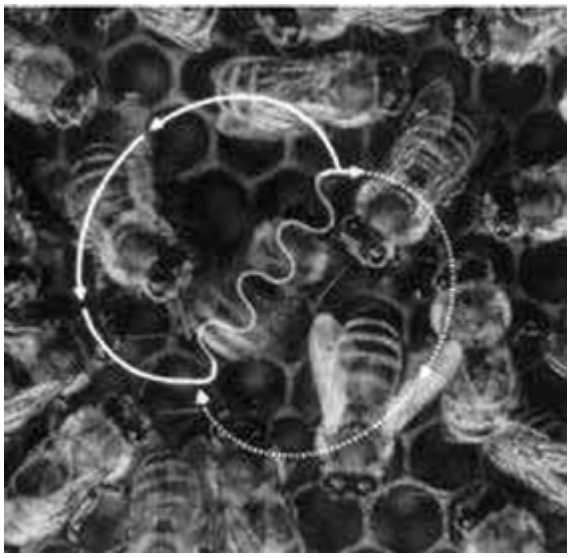
Upon their return to the hive, the scouts will do a little dance that will actually convey information to the foragers about the distance and direction that the food is from the hive.

There is a different dance for different distances:

- Up to 50 meters: The dance only conveys direction, not distance.
- 50 to 75 meters: The "round dance" is performed on the comb surface, with literal dancing in circular movements.
- 150 meters or more: The "waggle dance" is performed.

The "waggle dance" has two parts. The first part tells the foragers the direction of the food, while part two, which conveys information through the speed with which the dance repeats, indicates the

distance. Remember that the closer the food is, the better the bees like it.



A diagram of a bee performing the waggle dance. Photo courtesy of Toutz, M. Kleinhenz.

The scouts also use odor to provide information to the foragers. It is thought that the scouts bring back the unique scent of the flowers that they have visited to the foragers. The foragers will then proceed to go after the food that the scouts located to bring back to the hive.

So what happens when the foragers bring the food back to the hive? Pollen intended for honey making will need to be stored right away. The reason is that, if the pollen is not stored correctly, it will spoil. To protect the pollen from spoiling, it must be kept in a honeycomb cell mixed with honey, which acts as a preservative. This will prevent the pollen from spoiling and allow the hive to safely store the pollen until it is needed.

Nectar that is gathered by the forager is divided between the bee's main stomach and the honey stomach. Although this will be covered further in Chapter 8, here it is briefly: the honey stomach is the bee's second stomach. It is here that the rest of the nectar is processed into honey. Upon returning to the hive, this processed nectar is placed within the individual cells of a honeycomb and sealed in as the food supply.

Before we go further, it should be noted that it is best for the bees if they are allowed to store their own food for winter. Although this can mean less honey for the keeper, it will mean a much better chance for the hive (or hives) to survive the winter.

However, sometimes the keeper may find it necessary to provide supplementary food to the hive to ensure its survival. Also, when the keeper does find the need, it must be done properly for the health of the colony.

A bee gathering nectar from a flower. Photo courtesy of Stan Shebs.

There are a number of reasons that a beekeeper may need to provide supplemental food to the hives. Some of these situations include:

- Increasing colony size
- Sustained colony development during unfavorable weather conditions
- Sustaining the ability to feed the young during unfavorable weather conditions

- Not enough honey produced for winter
- Providing backup during a pollen/nectar shortage

However, there are only a few situations in which supplemental feeding would be *necessary*. As stated, the colony's own honey is what is best for the survival of the hive, including during the winter. A single hive/colony should have 60-80 pounds of honey available to them and their hives in the fall to carry them through the winter.

Furthermore, if and when it becomes necessary to provide your hive (or hives) with supplemental food, there are three options available that will provide the necessary nutrients that your bees will need: dry mix, moist cake, and sugar syrup.

Dry mix compositions include brewer's yeast or soy flour. The dry mix can be fed inside the hive into the brood nest (where the larvae are) or outside of the hive in an open container such as a tub or tray. However, if placed outside of the hive in an open container, the dry mix must be sheltered from becoming damp due to rain and dew. This can be accomplished simply by the addition of some sort of little roof structure set up over the container.

One drawback with feeding dry mix outside is that other bees besides your own may find and feed on it, so keep in mind the environment that your hives exist in.

Another feeding option is moist cake. Moist cake is made up of pollen pellets, sugar, and soy flour. Moist cake may be fed to the bees inside the hive. The cakes should be placed close to the larvae so the nurse bees (worker bees that care for the larvae) can feed their charges. If more moist cakes are made or obtained than can be used at any one time, they can be frozen for several weeks without losing any nutritional value.

Sugar syrup is made from cane sugar, beet sugar, or isomerized corn syrup mixed with water. A carbohydrate substitute, sugar syrup may be fed outside the hive in any open container. However, there must be something for the bee to stand on in the container if using a tray or dish for the syrup. Some keepers will install their own jar feeders as well.

Sugar syrup may also be fed to the bees inside of the hive as well. Some of the ways that this may be achieved is through:

- Empty chamber combs: Sugar syrup is placed (usually squirted) into empty honeycomb chambers, where it can be held for the bees to use.
- Division board feeder: A boxlike replacement for comb placed in the brood nest.
- Plastic bag feeder: A plastic bag encloses one or two frames in the lower edge of the nest. This will then hold the sugar syrup and allow the bees to feed.

It cannot be overstated that the bees' own honey is their best food; however, it can be comforting to know that there are alternatives that are healthy, safe, and nutritious if there is an emergency or a natural food shortage.

Keeping and caring for honeybees can seem a daunting task at first glance. One look at a beekeeping outfit can leave people feeling that the whole process is drawn out, complicated, difficult, and maybe a bit scary. Yet, in actuality, bees are industrious, organized little insects that are more than capable of taking care of themselves when correctly handled by their keeper. So, when approaching beekeeping, think of it more in the vein of caring for fruit-bearing trees than actual livestock, even though bees are (technically) considered livestock.

CHAPTER 5

EQUIPMENT

The equipment that you will need for your honeybees and your hives will vary, depending on the size of your apiary, number of hives, and amount of honey being produced. However, there are certain basics that any beekeeper will need, whether you have one hive or fifty.

The basics you will need are:

- Hive components (see Chapter 6)
- Beekeeper's suit
- Smoker
- Hive tool
- Equipment for handling honey

Basic Equipment

As the components that make up a honeybee hive require a more in-depth explanation, hive components will be discussed in Chapter 6. In this chapter, we will be dealing primarily with the tools of beekeeping.

The beekeeper's suit covers the keeper from head to toe. It helps to protect the keeper from the threat of stings. The suit should be white or off-white. Even a cream color will work: not only is white difficult for the honeybee to see, but a dark suit may also end up causing a case of mistaken identity, with you being mistaken for a predator and being attacked.

The **beekeeper's suit** consists of a hat and veil, gloves, and a full-body one-piece suit that covers arms, legs, and torso with sleeves and pant legs that will have Velcro or zippers to keep them tight to the body so the bees cannot get into the suit. Some keepers may also choose to include a pair of work boots.

A suited beekeeper at work. Photo courtesy of Wikimedia Commons.

The veils are mesh and should allow total clear visibility. Those veils that have solid sides can end up obstructing the beekeeper's vision, possibly creating a dangerous situation.

The newer suits are made from a cotton/polyester-blend fabric. It is strong and, although not sting-proof, keeps the beekeeper safe from stings. For the most part, the gloves are made from the same fabric. Not all beekeepers wear gloves, however, as many find it

difficult to perform delicate work with them on. Yet, as a beginner, you may decide to wear the gloves until you learn how to handle your bees and are more comfortable doing so.

You might see pictures in which the beekeepers are wearing no suit at all. While this is entirely possible for an experienced keeper, new or novice beekeepers should wear a suit, at least until they learn their way around their bees, which includes learning proper handling of the bees to minimize stings.

One final thing to remember when wearing your suit is to make sure it fits properly: the arm and leg openings should be tight against the wrist and ankles, with boots over the pants and a well-fitting hat and veil. Again, this is because you do not want bees getting into your sleeves, leggings, and veil areas.

A **smoker** is used to calm the bees so the beekeeper can get in to inspect the hive or gather the honey. Although there is much more to it, basically, the smoke will interrupt the bees' defense response.

A smoker used in beekeeping. Photo courtesy of Robert Engelhardt.

A smoker has three parts: the fire pot, the bellows, and a nozzle, which is used to direct the smoke in the right direction. In its most basic terms, think of it as sort of a coffeepot with the bellows attached to it.

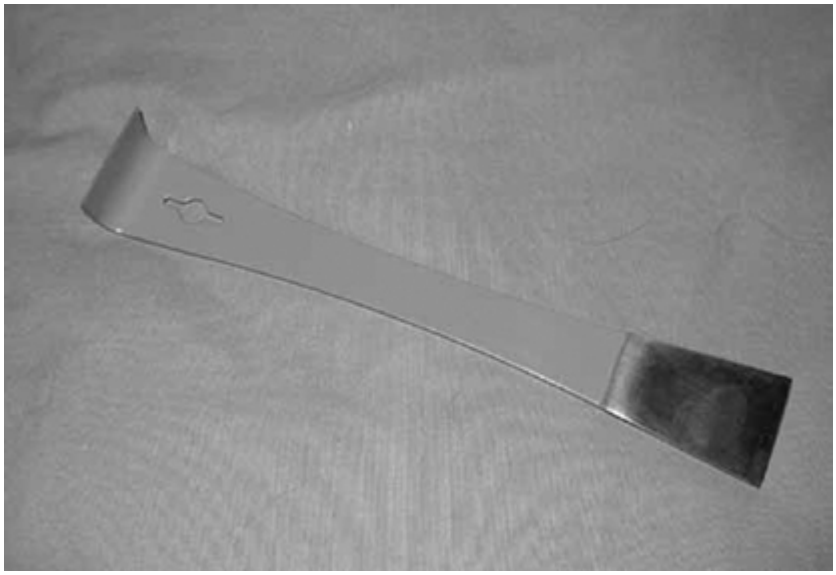
The smoker is operated quite easily. Smoldering fuel is placed in the fire pot. The fuel may be pine needles, burlap, pulpwood, or corrugated cardboard, although commercial fuel may also be purchased. Bellows, attached to the side of the fire pot, force air through the pot, which, in turn, forces smoke to come out through the nozzle to be directed where the keeper needs. The smoke should not be hot.

There are also newer styles of smokers available, which use heated coils (propane) that produce a smoke fluid, which is said to be less noxious to the bees, as well as using food-grade ingredients. Instead of continual smoke, the beekeeper can even pump the smoke as needed. Which type of smoker is used is up to the beekeeper.

As an interesting aside, it is known that the ancient Egyptians used smokers with their bees. However, their smokers were simply a piece of broken pottery or even a shell holding smoldering cow dung. The beekeeper would then blow the smoke at the hive to where it was needed.

A **hive tool** is simply a little pry bar–type apparatus with a scraper on one end. The hive tool has multiple uses, including removing excess brace comb, scraping propolis from hive parts, loosening hive bodies and frames, and dismantling the hives.

There are many designs of hive tools; however, if the tool is made of stainless steel, it is easier both to clean and sterilize.



A hive tool. Photo courtesy of Richard Engelhardt.

Equipment for Handling Honey

Finally, we have the equipment for handling the liquid gold, the honey.

The common equipment needed here is:

- Extractor
- Uncapping knife
- Strainers

The **extractor** does just what the name says: it extracts the honey from the uncapped combs. Basically, the drum or bucket of the extractor holds a frame basket where the honey-filled frames sit. The drums spin, and, through centrifugal force, the honey is thrown from the comb. The comb remains in one piece on the frame and may be used again by the bees.

An extractor, with full frames waiting for extraction (in background). Photo courtesy of c-hahn.

There are different types and sizes of extractors, from home versions holding as few as two frames to commercial types holding up to one hundred frames or more. However, extractors can be expensive, so some backyard honeybee-keepers may opt to simply cut the comb out from the frame, and then crush or squeeze the comb to release the honey. Some even do this by hand, although it can be a sticky mess. Yet, on a shoestring budget, it works. The biggest problem with this method is that the comb is destroyed, leaving the bees to have to rebuild it.

It may be possible to borrow or rent an extractor. Check with other beekeepers, clubs, or local organizations, as they may either rent or loan one out themselves, or at least know who does.

An **uncapping knife** cuts the wax caps off the comb before you put the call in for extraction. Most keepers use either a cold knife or electric knife that can warm up. Some may simply use a serrated bread knife.

For ease of cutting, the knife needs to be warm. Electric knives have their own heating element. Otherwise, the knives are dipped into hot water first. However, you must be careful not to get water into the honey, so dry the knife first.

Removing the caps for honey extraction. Photo courtesy of Justin Nussbaum.

Last, but not least, is the **strainer**. You can use either a kitchen strainer or the stainless-steel types sold by beekeeping supply companies. An important piece of equipment, the strainers remove all the wax bits and other impurities that may be floating around in your honey before you package it.

So, in a nutshell, these are the basic pieces of equipment the new beekeeper will need to own or have access to. Of course, there is more to learn about the equipment, and it is certainly necessary to do your homework before making your selections and, ultimately, your purchases. There are wide ranges in cost, quality, and size. As a new beekeeper, you will need to figure out what will work best for you, your bees, and your budget.

CHAPTER 6

HIVES

What is the hive? At its most basic level, the hive is a home and workplace for the honeybees, where they will live and raise their young. There are two types of hives: natural and artificial (or manmade).

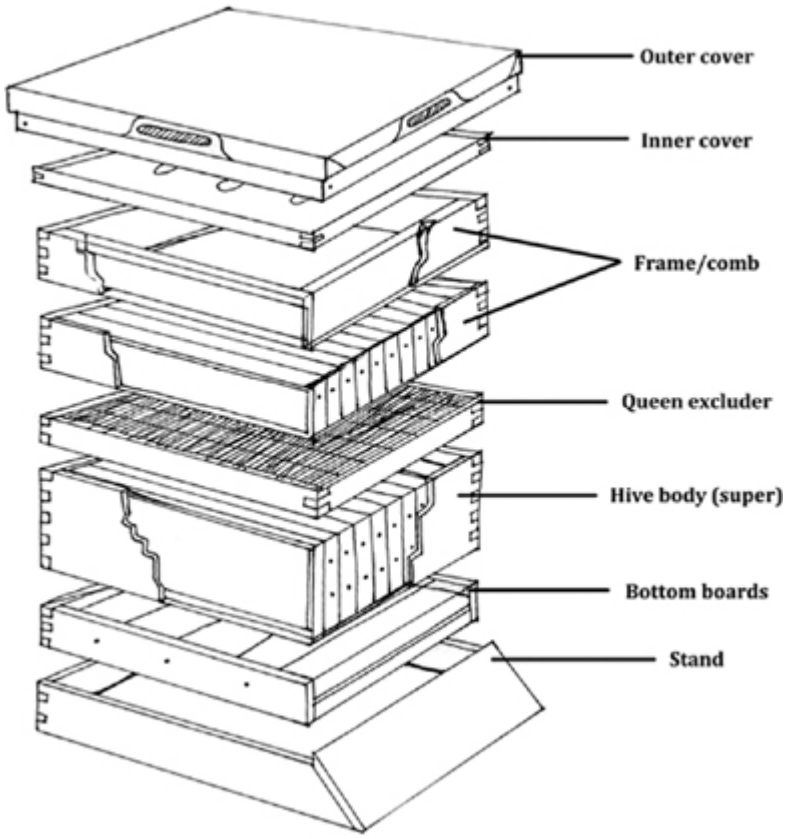
Natural hives are those that occur naturally in structures where wild honeybees may live. Natural hives may be found in rock cavities and hollow trees. They may also be found in the walls of buildings, usually abandoned buildings. You might also find combs in abandoned cars or even on branches. However, those that are exposed to the elements will not survive in areas of harsh winters and cold temperatures.

Artificial hives are man-made structures, usually wooden-box type, which are designed and built to house honeybees, their young, and their stores of food and honey. At one time, man-made hives were simply round, tall structures made out of coils of straw called “skepts.” Today, the artificial or man-made hive will most likely be made of wood and have several parts to it.

A reproduction of an old-fashioned bee skep. Photo courtesy of Kim Pezza.

The parts are:

- Stand
- Bottom boards
- Hive bodies or supers
- Frame/comb
- Queen excluder
- Inner cover
- Outer cover



The hive and its parts. Illustration by Ariel Delacriox Dax.

Parts of a Hive

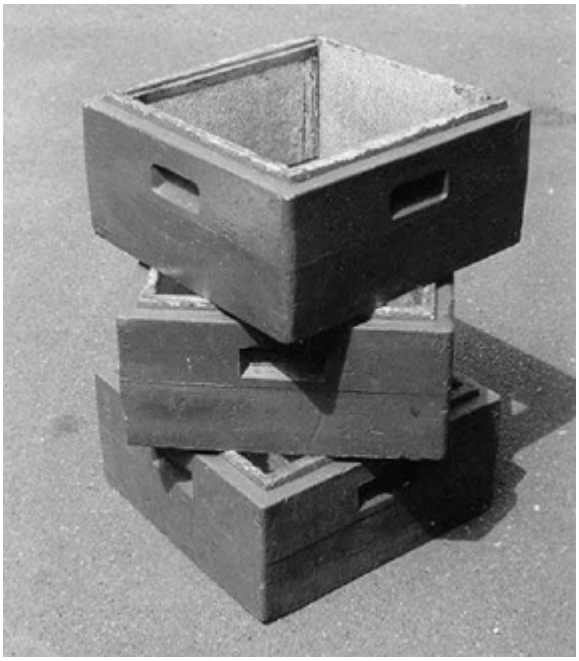
The **stand** is down at the very bottom of the hive. Although it is an optional piece of equipment and is not necessary to the hive, it does provide a landing board for the bees, making it easier for them to get into the hive.

A beehive. Photo courtesy of Imkerei Hartmann.

There are two styles of **bottom boards** to choose from: solid and screened. These are exactly as they sound. The solid bottom board has a solid bottom. You can use it to help keep the hive a bit warmer in areas where the winters may be harsh and cold. However, it does not allow dirt and debris to escape from the hive. Screen bottom boards are covered with a screen bottom instead of solid. These can aid in ventilation, especially in areas with hot summers or climates. You will need only one or the other in your hive. It is best to choose according to your honeybees' needs. Some beekeepers may use a screen bottom in the good weather and swap out to a solid bottom during cold winter months, but, again, it is your choice.

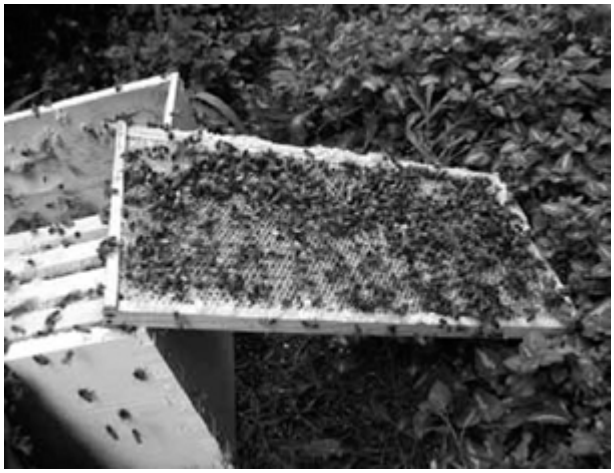
Hive bodies, or supers, are the large boxes that make up the body of the hive. There are two supers for each hive: the deep super and the honey super. The deep super is a large hive box that holds ten frames. The honey super is the box that holds the frames where the bees will store their honey. The deep super frames are made from either wood or plastic. The frames will usually have a wax foundation in the middle, and are used by the bees to build their own wax on. Honey super frames fit in the **honey super** and are

also for the bees to use as a base to build on, as with deep super frames.



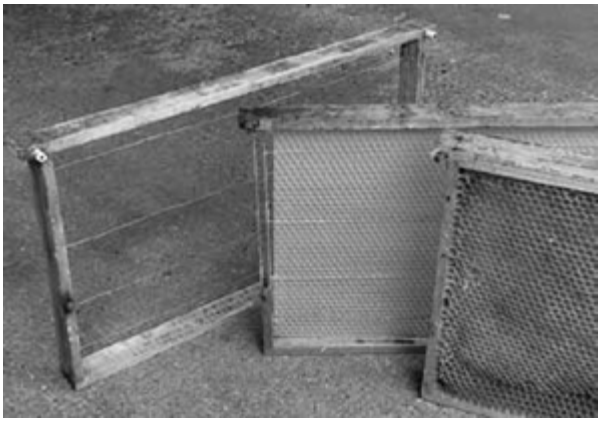
The super or hive body. Photo courtesy of Wikimedia Commons.

Frames are simply the pieces that slide into the super to allow the bees to build their combs. Think about a really, really simple wooden picture frame, but with a wax sheet where the glass would go, and you have the basic idea. Because they slide in and out, it makes for easier removal and allows the beekeeper to check the hives periodically without harming the honeycomb.



Bees resting on one of their frames. Photo courtesy of Wikimedia Commons.

The **queen excluder** is a flat rack that has holes large enough for workers to get in and out, but small enough not to allow the queen to get out. Usually made of metal or plastic, it is used to prevent the queen from getting into the honey super and lay her eggs in the honey. Although it is not absolutely necessary to have an excluder in your hive, many keepers find it quite helpful.



Beehive frames. Photo courtesy of Axel HH.

The **inner cover** of the hive is made of wood angles on the super at the top of the stack. It has two entrance holes: one in the middle, and one to the outside, as well as a winter side and a side for the

rest of the year. Basically, it is rim-side down for the winter and rim-side up for the rest of the year.

There are many types of outer covers to choose from, but one of the most popular has a galvanized metal top attached to it. Outer covers are basically ones that go over the inner covers with sides that hang over, providing a snug fit and protection from the weather.

There are also a few other options to consider for your hive. One is an entrance reducer. Entrance reducers are small pieces of wood that fit between the bottom board and first deep super. They make entrance holes smaller, keeping your hive safe from robber bees and controlling the traffic in and out, as well as helping with ventilation and temperature control.

The **slanted wrap**, another option for the hive, helps ventilation and congestion by providing warm room between the entrance and the brood area.

Honeybees at the entrance to a hive. Photo courtesy of Wikimedia Commons.

Besides the standard hive type, which as its name suggests is the most common type of hive that you will probably see both in use and for sale, there are a few other styles/types of beehives. They are not overly common (at least in the United States), so I am just touching on them so you are aware of other hive options. Some

beekeepers believe that these are a more natural and bee friendly way to keep their bees.

The alternative hive styles are:

- Warré
- Delon
- Top Bar

Let us now take a brief look at each of the three styles.

Warré

The **Warré** hive was developed in the early 1900s by French monk, Abbé Émile Warré, who was also the author of L'Spiculture Pour Tous ("Beekeeping for All"), a book that is still available today.

The basic concept for the Warré is boxes, but with bars instead of frames (for the bees to build their combs), with the bars having a started strip attached, which allow the honeybees to build their combs. With the Warré, the hive is usually opened only at honey harvest time. This is due to the bees building their comb downward from the top bar. Being that there is no frame, the comb can and, many times, is damaged during opening.

The Warré was initially used in France, Switzerland, and Belgium, with it coming to use in the United States around 2008.

Delon

The **Delon** hive is also known as the Stable-Climate hive. Developed by Roger Delon, who was a commercial beekeeper in France and Switzerland, the hive basically reconfigures a Warré and is based on a hollow tree.

Top Bar

The **Top Bar** hive is a very basic hive style (probably one of the most basic). The box is in the shape of an inverted triangle with legs and a cover (looking like a wooden feed trough). There are bars running across the top, allowing the bees to attach and hang their combs (again, no frames). It should be noted that this style is best suited for tropical and temperate climates.

Ancient Greek Top Bar beehive. Photo courtesy of Wikimedia Commons.

The early Top Bars of Ancient Greece are thought to have had an even more basic setup: baskets with bars across the top. The concept is thought to be thousands of years old.

As the Top Bar hives have no frames, the honey cannot be removed from the comb with an extruder (this would apply to the Warré and Delon as well). However, the nonbrooder combs (which we discussed in Chapter 3) may be used as cut-comb honey (basically, a cut honeycomb), which can be highly prized, or you can actually squeeze the honey from the comb with your hands.

So, in a nutshell, these are the three other alternatives that you have available to hive you bees. If you are seriously considering one of these hives, it is strongly advisable to do your homework before you jump in. If you are able to, go online and find beekeepers that actually use or have used the style that you are interested in. If you cannot get online, the local extension office should be able to tell you about beekeepers in your area, as well as beekeeping organizations in your area, region, or state. Ask about the pros and cons, areas that the hive is best used in, ease of use, safety issues (for both you and your bees), and any honey-production issues. (Remember that, even if you are not harvesting honey, your bees still need it to sustain themselves.)

You may be able to purchase these three hives, but you can build them as well. (I have included websites that have plans for building your own hives in the "Resources" section.) Keep in mind that, whatever style/type of hive that you decide to use, make sure that it is the best one for both you and your bees.

Setting Up Your Hive

Whatever you choose for your hive, it is important to keep your hive up off the ground. This is easily done by setting the hive on cinder blocks with boards running across them (to stabilize the hive on the block).

Another important step in hive construction is to give the hive's wood extra protection from the elements. Most keepers will paint them. Make sure to only paint the exposed outside areas, however. The bees will take care of the inside by covering it with a plant, sap, and wax mixture of their own making called propolis.

Finally, when the hive is done, you need to find the right spot for it. It should be away from roads or pathways when possible. This will help to prevent your bees from being

bothered by too much human and pet foot traffic, which would result in them becoming grumpy and on the defensive.

The ideal placement should also feature limited exposure to wind, have a water source nearby for the bees, and be in an area of good drainage. It should be level, have some sort of wind block (especially if you are in an area of cold and snowy winters), and have a good balance of sun and shade. More sun is preferable than more shade if you cannot find the "perfect" spot, as your bees will slow down if it is too cool and shady.

Do not worry if you cannot account for all of these conditions when placing your hive. Yet do remember one thing: be sure to allow easy access for yourself. For the other steps, do what you can, but things like sun and a dry area are important to your hive, as is the water source (which you may have to create yourself if there are no natural sources nearby).

Establishing a Colony

Now that you have built and placed your hive, it is time to establish a colony in it. There are a few ways to obtain a colony: buy one, have one given to you, or catch a swarm and establish it in your hive. It is most likely that you will purchase your first colony.

If you would rather not purchase your first colony, the other common option is to attract a natural swarm. Swarming is when a group of bees will leave the hive due to it becoming too crowded. Sometimes, the swarm is started by the queen, but it is usually a decision of the workers. The swarm is actually the formation of a new colony, breaking off from the old.

Although intimidating in appearance, honeybee swarms are usually quite docile during this initial period, due mainly to the fact that they are concentrating on finding a new home and having no young to protect. Even so, should a swarm feel threatened or endangered, it may become aggressive.

Swarms can usually be seen hanging off of a tree branch. The honeybees may remain there for a few days until they find their new home. **Swarming** can leave honeybees quite vulnerable, since the only food that they have is what they were able to bring with them in their stomachs, and, if a suitable home is not found quickly, the bees will starve. Again, it is up to the scout to find the perfect location and persuade the rest of the colony to follow.

Some experienced beekeepers see a swarm as an opportunity to add another hive to their apiary. In fact, a successful capture of a swarm is fairly commonplace.

Swarms may be caught by simply capturing them in a box called a nuc. Swarm traps are also available, or the swarm may be sprayed with a sugar solution, and then shaken off its branch onto a white sheet with the nuc sitting on it. The bees will see the nuc opening and walk in. This works best on a sunny day. Some keepers will also collect swarms using suction pumps.

Due to the fact that it is best for only experienced beekeepers to catch swarms, capture methods have been touched on here only briefly. Should you find a swarm that you want to start a hive with, you should have an experienced person with you to do the capture. This is not only for your safety, but for the bees' safety as well.

A swarm of bees. Photo courtesy of Wikimedia Commons.

For the beginning beekeeper, it is best to purchase your bees from a reputable dealer or keeper in your area, some of whom may have a hive available for purchase. The best way to deal with your purchased bees and get them into the hive would be to follow the directions that *should* have been sent with the bees. If you believe that you will still have a problem, it could help to contact another beekeeper who would be able to either transfer the bees into the hive for you or guide you through the process yourself. Although you may be charged for the assistance you are being given, remember that a few dollars out of pocket at the outset beats losing all your bees because you did not do it properly.

CHAPTER 7

POLLINATION

Honeybees are important pollinators. They are responsible for pollinating approximately 80 percent of the crops in the United States, a value of anywhere between $10 billion and $15 billion a year.

So what exactly is pollination? Pollination is the movement of the pollen from the anther (male) to the stigma (female) of a plant or flower.

Pollination. Illustration by Ariel Delacriox Dax.

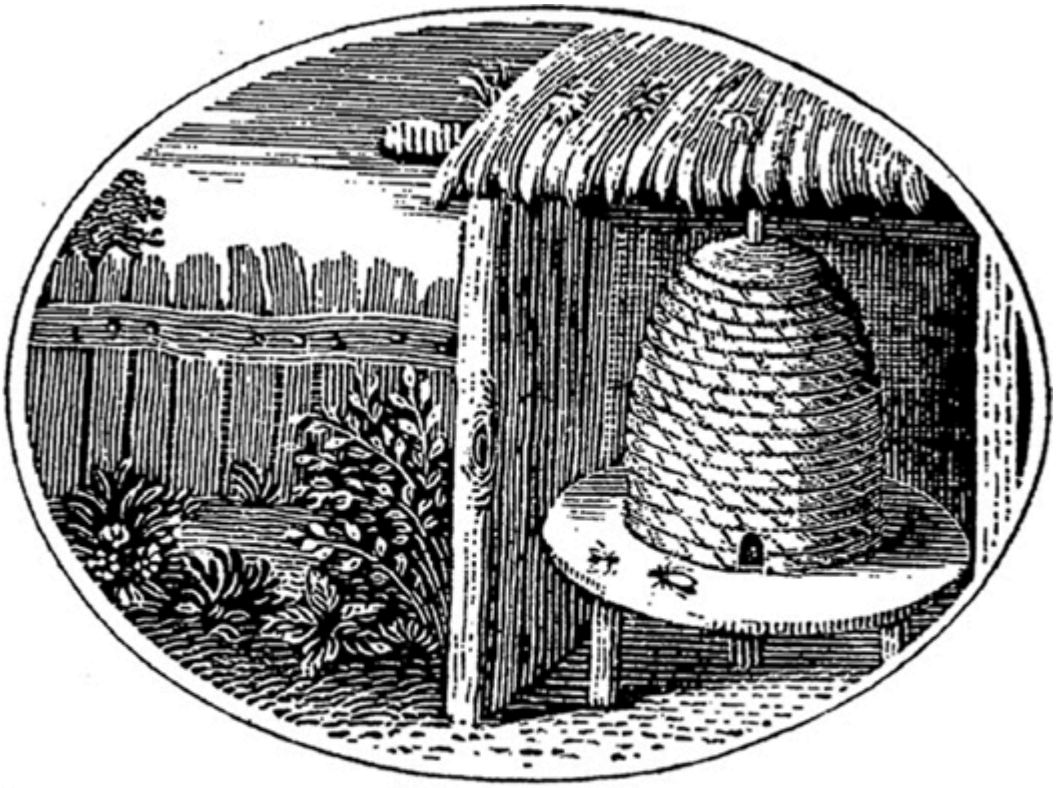
Plants need pollination for a variety of reasons. Some plants have separate male flowers and female flowers, so the pollen needs to go from flower to flower. Sometimes, a single flower can have both the stigma and anther, but it is unable to self-pollinate. Other times, pollen needs to go from an older plant to a younger one, as the stigma of the other plant is ready before its pollen is released. Still, other plants (or trees) have specific male and female plants, meaning the plant is either totally male or female. In all these cases, pollination from a bee, bird, or even a bat is necessary, as, unless the pollen is light and can travel on the wind or water, it needs help to do the job.

It is interesting to point out that some plants, such as blueberries and cherries, rely almost entirely on honeybees for pollination. Other plants, like almonds, do depend entirely on the honeybee for their pollination needs.

Although other insects and birds do pollinate, as do some bats, honeybees are the superior pollinators; unlike the others, which really happen to get into the pollen only while feeding on the nectar, which is what they really want, the honeybee looks for the pollen as well as the nectar, as it needs both in order to feed its larvae and itself. In other words, while other pollinators might find pollen, honeybees actively pursue it. They prefer plants that are close to the hive, but will travel.

Although the honeybee is the only pollinator used commercially for pollination (by transporting hives to orchards and crop areas all over the country), much of the pollination is still done naturally, meaning no hives on-site, with the bees just finding the spots on their own.

There is much more to pollination, and, as a serious beekeeper, you will need to learn more. Yet, for now, we are just stating the obvious. Honeybees are very important in the production of a large portion of our food.



CHAPTER 8

HONEY AND WAX HARVEST

We have been discussing the honeybee and the honey they produce throughout this book. Yet what exactly is honey? We have touched on it a bit, but there is much more to the story.

First, let us get a little history on honey.

Bees have been producing honey for 150 million years. In fact, during at least one period in history, honey had quite a value. During these times, honey was occasionally even more valuable than the currency of the time.

The ancient Egyptians, themselves innovative beekeepers, used honey for, among other things, embalming. The pharaohs even valued it to the point where honey was placed in their tombs. Many tombs also have drawings and paintings of the honeybee.

Honey was also an important food in ancient Greece, and Spain has cave paintings of bees and beekeeping from as far back as 7000 B.C.E., making them the earliest known records of beekeeping.

In Germany during the eleventh century, peasants paid their feudal lords in honey and beeswax, and, in much of Europe, it was not until the Renaissance (when sugar made its appearance) that honey lost its importance. By the late seventeenth century, honey was overtaken by sugar in use.

So what exactly is honey, this food that was so valuable in ancient times?

To quickly review the information touched on in Chapter 4, honey is produced when the forager bees gather nectar; the nectar goes into the bees' second stomachs, or honey stomachs, where it thickens. The foragers then return to the hive, where the thickened nectar is deposited into a cell. There, more water evaporation takes place, where it turns into the end product, honey.

The honey not only contains sugars, minerals, amino acids, vitamins, and antioxidants, but it is also the only food that includes everything necessary to sustain life, including water. It is the only food that never spoils, as bacteria cannot grow in honey. If stored, honey will crystallize (meaning it gets sugary looking); however, simply reheating it will restore it to its previous form. In fact, when some honey was discovered in the tombs of pharaohs, it was found to still be edible when tasted by archaeologists.

Yet remember that the honeybees are actually producing this incredible foodstuff for their own food stores. For them, their honey provides 80 percent of the sugars and 20 percent of the water, minerals, and other nutrients that are necessary for their survival. So, as a responsible beekeeper, you need to be very careful as to how much honey you remove from your hives each year.

Not to mention that it also takes a lot of work on the bees' part to create the honey. In fact, a single bee will produce only one twelfth of a teaspoon of honey in her brief, but busy lifetime; and it takes the pollen from about two million flowers to make a single pound of honey.

Types of Honey

There are many types of honey, and the type of honey you get depends on where your bees are getting their nectar from. In other words, if the bees feed on orange blossoms, you would have orange-blossom honey. If they are around clover fields, you get clover honey. If they feed from buckwheat fields, they will produce

buckwheat honey, and so on. Wildflower honey would be honey made from various wildflower sources. In some honeys, these nectars and flavors may be blended as well. The color of the honey ranges from very light to very dark, with the flavor also depending on the nectar source.

Many consumers will ask if the honey is organic. While some areas do certify that their honey is organic, it is not the norm for the industry. It is very difficult to be sure that the honey that the bees produce is organic, for the simple reason that you do not know for sure where your bees have sourced their nectar and pollen. Even though you may have your hives in an organic orchard, for example, what if a few bees ventured away from the orchard to a neighbor's fruit tree in his yard? Or another orchard a mile away, which may or may not be organic itself? As a result, few organic-certification organizations will certify honey as organic.

As a consumer, there are a few different ways that you can purchase honey. There is liquid honey, which is the most common form of honey there is. Liquid honey is what you normally see for sale in jars or little squeeze bears. Then there is granulated or crystallized honey, which has a sugary look to it. Creamed honey is liquid honey with finely crystallized honey added to it, while cut-comb honey is pieces of honey-filled comb, usually cut and sold in squares and, occasionally, rounded shapes. Finally, there is chunk honey, which is simply chunks of comb in a container of honey.

Many commercial honeys found in grocery stores have had the pollen filtered out. That leaves only the nectar, and although it is all natural from the honeybee, it is not considered real honey. Also note that, unless your store-bought honey says 100-percent organic, raw, or natural, you risk having corn syrup or high-fructose corn syrup mixed in. (In fact, imported Chinese honey can be up to 40 percent corn syrup.)

Beeswax

When talking about honey, we cannot forget the all-important comb or beeswax. As discussed in Chapter 4, the wax is used to build the comb, and the combs are used to rear the young and store the honey and pollen. It takes about 10 pounds of honey to produce one pound of wax. Of course, the wax is produced by the worker bee. In brief, wax scales are secreted from the eight wax-producing glands on the inner side of the sternites on the abdominal area of the bee. The temperature in the hive needs to be between 91˚F and 97˚F for secretion to take place. The honeycomb wax begins as almost white, but becomes more and more yellow or brown as the pollen oils and the propolis incorporates with the wax. It takes approximately 1,000 scales to produce one gram of beeswax.

Location of wax glands on bee's anatomy. Illustration by Ariel Delacriox Dax.

The wax can be harvested at the same time as the honey. If you are leaving the columns on the frames to use, the cappings that are cut to allow the honey to be extracted from the comb can be saved, cleaned, and processed. If using the crush-and-squeeze method, then the comb is rendered unusable to the bees, but the wax can still be saved and used by the beekeeper.

In brief, to claim the wax (but not the cell), separate the wax from the honey, but let the wax cool and harden. Re-melt and strain the wax of any impurities, and allow it to harden.

Although extraction was discussed in Chapter 5, some may decide that they want to harvest the entire comb instead of just the honey from the frame. This would be to produce cut-comb honey.

Cut-comb honey is just the comb taken from the frame, then cut into pieces (usually squares) and packaged. It is honey in its truest, most natural, and basic form, as there is no other processing involved.

Finally, there is one little tip that can help in the honey harvest. Simply put, raise gentle bees. Gentle bees are easier to work with, especially at harvest time. There is what is called a "gentleness test": basically, the gentleness test is how the bees react when the hive is opened and the brood nest is exposed. If the bees are "gentle," they should pretty much ignore the entire situation. An aggressive hive, on the other hand, may attack. In fact, the website, www.coloss.org, has a 1-4 gentleness scale chart, which may be helpful in determining where your particular colonies may stand.

You will probably find that your bees have better manners during certain times of the day or certain weather situations. For example, you may find them to be more defensive later in the day, but gentler when the weather is warmer. Just remember that the gentler your bees, the easier your job will be, whether it is during harvest time or just through general care and maintenance of your hives and colony.

CHAPTER 9

HONEY AND WAX USES AND STORAGE

Honey has many varied uses, not only in the culinary world, but in the medicinal sphere as well. Let us look briefly at the medicinal side of honey first. Remember that, as you review, this is only a short outline. You should do your own in-depth research on honey for medicinal use and speak with a doctor or other medical professional as necessary.

Honey as Medicine

The medicinal use of honey dates back as far as the ancient Egyptians, who used it to dress wounds. Aristotle recommended using honey for a number of different ailments, and Hippocrates also touted the use of honey not only for wound dressing, but to ease sore throats as well. It is still considered a good remedy for soothing sore throats and coughs today.

Presently, a great number of people turn to honey as a medicine, as it is said to speed healing, combat infection (due to the fact that it can inhibit bacteria growth), stimulate skin regrowth (on a wound), and, as a result, reduce scarring, as well as help control stomach discomfort due to the ability to fight bacteria in the intestine.

In short, honey:

- Is an effective antibiotic
- Cleans infection
- Reduces pain, inflammation, and swelling
- Encourages fast healing, resulting in minimal scarring
- Prevents bandages from sticking to wounds
- Reduces pain from burns by acting as a barricade and protecting air from hitting the burned skin

It should also be noted that the darker the honey is, the better it will serve as an antioxidant and antibacterial remedy. The darker the honey, the less water it contains. Buckwheat honey, in particular, bears mention as being high in antioxidants.

It is also said that some diabetics may be able to use honey. However, this is still quite controversial and must be considered only upon consultation with a doctor.

Again, this has been only a brief look at honey as medicine. Although most of the uses have been tried and utilized for centuries, I have not included enough information for anyone to just start medicating themselves with honey. You will need to do your homework, as well as check with your doctor, before trying unfamiliar remedies.

Storing Honey

Storing honey is neither difficult nor time consuming, and it can be stored indefinitely if stored properly. Although it should be kept in a cool area for long-term storage, honey needs no refrigeration, and, in fact, should not be refrigerated.

Honey should be kept in a tightly capped container (as it can absorb moisture) at temperatures ranging from 65˚F to 75˚F (basically, room temperature), and should be kept away from stoves, ovens, and sunlight. Again, should the honey crystallize, simply

place the jar in a pot of water, gently heat, and stir. Do not overheat, as overheating may caramelize the sugar and even change the color and flavor of the honey. Why can you get crystallization in honey? A few reasons are cold temperatures as well as raw honey with a high pollen count.

Royal Jelly

Royal jelly is another by-product of the bees. Used since ancient times for both medicinal and cosmetic purposes, royal jelly is rich in protein, vitamins, fats, and minerals. Today, it is sold as a dietary supplement, and, so far, cannot be made synthetically.

While the ancient Chinese used royal jelly as an aphrodisiac, the ancient Egyptian pharaohs believed that it would keep their bodies young and beautiful in both life and death. Like honey, royal jelly was also used in mummification. Today, royal jelly is used to treat a number of symptoms and ailments, including asthma, insomnia, hay fever, symptoms of menopause, and even some skin problems.

Royal jelly may be purchased in many forms, and is available commercially in tablets or capsules, powder, or freshly frozen in its natural state, with most agreeing that the latter is the best way to purchase whenever possible.

There are a number of ways to consume royal jelly; the "Resources" section of this book offers a link to an excellent website that suggests how to use royal jelly properly, written in a straightforward, easy-to-understand manner.

It must be said that royal jelly can be expensive, as it is so time-consuming to harvest. Also, unlike honey, royal jelly is perishable in its natural state, requiring immediate refrigeration or freezing upon harvest.

It is important to note too that some people may have an allergic reaction to royal jelly. You should be especially careful if you are already known to have an allergy to honey or bee stings. If ever in doubt, consult a doctor before consuming.

Although the benefits of royal jelly are questioned today, one has to wonder why, if it has no benefits, royal jelly has been in use since ancient times.

So, if your bees present you with a lot of honey, or you have even purchased in bulk from a local apiary, do not worry. As you can see, honey is easy to keep.

Beeswax

Some keepers will also prepare and use the wax after the honey has been removed. Although it is a process, and some keepers choose either to allow the bees to keep their combs after the honey has been removed from the frames or simply give the wax away or discard it, others will clean it for later use.

Some beekeepers will melt the wax in a pot in a low-temperature oven. As the wax melts, the honey and debris will drop to the bottom, while the wax will rise to the top for skimming.

Another, more popular method is to drop the comb in a pot of water. The water is allowed to come to a boil, melting the wax. The wax will rise to the top, while any debris or bits of leftover honey will sink to the bottom.

The pot is then removed from the heat and allowed to cool just long enough so the wax may be handled without you getting burned. The wax is placed into a double boiler and remelted, at which time any remaining debris may be removed (some people will also put it through a strainer to catch more debris). The wax is then poured into a mold (usually a square or rectangular block mold),

allowed to harden, removed from the mold, and stored in a cool, dry place until ready to use.

Beeswax may be used for cosmetics, crafts, ornaments, batik, and candles, and can even be rubbed onto thread to give it some strength. However, when using beeswax for cosmetics, check with the beekeeper (if not using wax from your own bees) to make sure that no chemicals were used with the bees, as these can sometimes get into the wax and may be harmful to humans.

Finally, when melting beeswax, no matter what you are melting it for, it should be noted that, while the beeswax will not boil, it can catch fire. This can be somewhat avoided by not melting the wax in a pan (unless it has water in it) or simply melting the wax in a double boiler.

As you can see, there are many different ways to utilize beeswax. Use your imagination and have fun trying out different uses for your very own farm-fresh beeswax.

CHAPTER 10

DISEASES AND DANGERS

Like any animal or insect, honeybees can become ill through parasites and diseases. Even under the best circumstances, your hive is always at risk of diseases and parasites being introduced. There are a number of diseases and parasites that pose danger to honeybee colonies that anyone considering beekeeping should be aware of.

Robber Bees

We have discussed things that can affect the health of your hive: diseases, parasites, loss of the queen, starvation, and so on. However, one obstacle not mentioned is your hive being burglarized by the last people that you would expect: other honeybees.

The aptly named **robber bees** usually come about during hard times food-wise. Bees from one hive will come and steal the stores of another hive. A robber bee finds hives by scent and goes back to its colony. Then they get together and go back to steal the stores of the other colony.

After the scout robber finds a target hive, it will look for an unprotected entrance and weak spots among the guards. Once it has

found that, it will return to its home and send others to come and steal the honey.

Sometimes, the worker bees will be able to fight off the robber bees. Other times, the robber bees can decimate a hive, as they will continue to return until the honey is gone. In fact, should the robber bees attack in groups, especially when a hive is weak, the invaders can overwhelm the entire colony, resulting in many deaths and, in extreme cases, even the killing of the queen. Robber bees will leave the victim hive or hives to starve to death.

Compounding the problem is the threat of foreign infection. Robber bees can also spread disease, and not only to the victim hives. If one of your hives turns robber (due to insufficient food stores) and goes to another hive in an apiary that has a disease problem, it will bring that disease back to the hive. Likewise, if your healthy hive is invaded by diseased robber bees from another apiary, they can spread the disease to your hive. At the same time, if your hive is diseased, the robber bee that invades it will take the disease back to their apiary and hive.

There are ways to protect your hives from robbers and prevent your own bees from becoming robbers. Keep the entrance to the hive small. Make sure that your hive/colony is strong and healthy. The stronger and healthier it is, the better your bees can defend themselves. Finally, to prevent your own bees from becoming robbers, make sure that your colonies always have enough food. In lean foraging times, this may mean providing supplements and substitutes for your bees to eat. It may also mean not taking honey for yourself so your bees have enough to sustain themselves throughout the winter.

Whether it is your bees turning robber or you are invaded by bees from another apiary, robber bees are something that you do not want or need around your hives or colonies.

Parasites

Varroa Mites

Varroa mites feed on the bodily fluids of the honeybees in every stage of life: larval, pupal, and adult. Seen on the bee as a small red or brown spot on the thorax (and visible by the eye), the varroa mite carries a virus that causes noticeably deformed wings on the honeybee.

While the varroa mite is admittedly more of a problem during the winter preparation time or in times of poor foraging (both of which are periods of low colony population), it can be a serious threat to your hives. The varroa mite has almost eliminated whole colonies in some areas, as well as causing problems in apiaries, although, in some of these places, the bees are recovering and making a comeback. It is also thought that the varroa mite may be a contributing cause of colony collapse disorder, which is further discussed in Chapter 13.

A varroa mite. Photo courtesy of Wikimedia Commons.

Fortunately, there are treatments available for honeybees against the varroa mite. Some treatments are chemical based, while others are mechanical or manual treatments.

The substances used in chemical treatments include formic acid, oxalic acid, fluvalinate, thymol, and coumaphos. Although it is said that these chemicals should not cause any problems with the honeybees, they are not to be used during the time that honey is being produced when intended for marketing or consumption.

Mechanical or manual treatments of the varroa mite include drone-brood sacrifice, which is the elimination of the brood. Powdered-sugar dusting of the bees is also said to work, as it encourages the bees to clean themselves, leading them to dislodge some of the mites. Screen bottom boards on the hive are also recommended when using this technique, as it allows dislodged mites to fall through the cracks instead of into the hive.

These are not the only treatments available for a hive dealing with varroa mites, but they are the most commonly used. However, there are a variety of resources available to the novice beekeeper for treating this and other infestations. You should always seek the treatment method that is best for you, your bees, and your hive.

Acarine Mites

Believed to have come to the United States through Mexico, **acarine mites** (also known as tracheal mites) infest the airways of the honeybee. The mature female mite will then make her way out of the bee's airway and out onto the bee's hair. At that point, it waits to transfer to young bees, where it will again infest the airway and begin to lay eggs.

Acarine mites almost wiped out the British Isles' bee population in the early twentieth century. As a result, the Buckfast bee was developed at Buckfast Abbey.

Treatment for the acarine mites can be pretty simple through the use of grease patties. Grease patties are one part vegetable shortening combined with three to four parts of powdered sugar. The patties are then placed on top of the bars of the hive's outer cover.

The bees will then nibble at the little cakes, and, when they do, the shortening makes it almost impossible for the mites to infest the young bees. This, in turn, causes some of the mites to die before they are able to locate a young bee and reproduce, as a young bee is necessary for the mites' reproduction process.

Wax Moths

The **wax moth** feeds on the wax of the honeycomb, used brood cells, and cell cleanings, all of which contain essential proteins for the development of the wax moth larvae. This destruction of the honeycomb may cause stored honey to spoil and/or become contaminated. It can also kill the honeybee larvae.

The wax moth will spread rapidly at high temperatures, usually at 90°F and above. However, in regions where this type of temperature occurs only occasionally, the hive will experience few problems with the wax moth (unless it is already a weak bee colony).

There are a few treatments for hives troubled by the wax moth. Two of the most common methods are strong hives taking care of the problem itself, with the honeybees killing and cleaning out the wax moth larvae and the webs that the larvae create to move around on and then leave behind. The second treatment takes advantage of the fact that the wax moth can be killed by freezing. So, in colder climates, hive storage in unheated sheds, barns, or outdoors could also work as a treatment.

However, with all that said, the stronger your colony is, the more that it will be able to protect itself from the wax moth.

Small Hive Beetles

The **small hive beetle** is a small, dark beetle that lives inside the hive; it is a scavenger of weak hives/colonies. The small hive beetle will cause considerable damage within the hive by tunneling through combs, ruining the combs, and killing the brood. The beetles can even contaminate the honey, rendering it unsalable by

the keeper at market and unpalatable to the honeybees themselves, leaving it useless to all involved.

Thankfully, controlling the small hive beetle is not a complicated matter. The larvae may be trapped as they try to get down to the soil. Alternatively, the soil in front of the infected hives may be safely treated with predatory soil nematodes. Nematodes are nonsegmented worms, usually one-five hundredth of an inch in diameter and one-twentieth of an inch long. They are also called roundworms. These nematodes will attack the hive beetle larvae.

Cleanliness will also play a part in controlling small hive beetles. Do not leave your cappings exposed and do not leave filled supers standing. As a side note, if you have fire ants, they may also pray on the pupating beetles.

Fungal Infestations

Yet another problem that the colony/hive may have to deal with at some point is fungal infestations. Two examples of this problem are nosema and chalk brood.

Nosema

Now considered a fungus rather than a parasite, **nosema** is a unicellular fungus that gets into the intestinal tract of the adult honeybee. Nosema reproduces by forming spores, which are then passed and spread in the bees' waste. As a result, the bees can run into their biggest problems when dealing with nosema in those circumstances in which they are unable to eliminate waste from the hive. They can then develop dysentery.

There are two species of nosema: *ceranae* and *apis*. Nosema ceranae can cause the rapid decline of the colony's population, can affect the hive at any time of the year, and, worst of all, has no observable symptoms.

Nosema apis is the biggest problem in spring and winter. However, heavy summer rainfall can also contribute to the problem.

It is also the most common and widespread of the two variants, and has the ability to wipe out entire colonies.

In its dormant stage, *Nosema apis* is long lived, as well as being resistant to extreme temperatures and dehydration. A common sign of an infected hive or colony is unusual feces on the outside of the hive; on the inside, the most noticeable symptom is combs covered with brown freckles.

Treatment of nosema (both varieties) include increasing ventilation in the hive as well as treating with Fumagilen B, which renders nosema unable to attach to the cells in the honeybee gut, therefore leaving the fungus unable to reproduce.

Treatment for the apis strain also includes thoroughly cleaning the hive and removing any contaminated combs. Also, although cold does nothing to kill *Nosema apis*, heat treatment of the infected hives for 24 hours will.

Two more treatment options are transferring all bees in the infected hive into a clean hive and re-queening whenever necessary. This can be done even by beginner beekeepers, but, if you are hesitant, contact your local beekeeping association or extension office to ask for some guidance from an experienced beekeeper.

Prevention of nosema includes reducing stress in the hive, removing any contaminated frames, relocating the hive to warmer, dryer locations, rotating hive sites, re-queening as necessary to help keep the hive strong, and, finally, good hygiene of both the beekeeper and the equipment.

It may also be worthwhile to note that the Caucasian bee types may be less resistant to nosema than other types of honeybees.

Ascosphaera apis (Chalk Brood)

Another fungal problem that colonies may face is chalk brood, or **Ascosphaera apis**.

Chalk brood infests the gut of the honeybee larva. There, it competes with the larva for food, where it then causes the larva to starve. After the honeybee larva dies, it will then be devoured and

appear white and chalky, hence the name chalk brood. It also causes mummification of the brood.

Chalk brood will rarely kill an entire colony, but can substantially weaken it. Hives can usually recover if ventilation in the hive is increased.

As with other problems that can affect your hive or colony, stress can contribute to the problem. Broad temperature changes may trigger the problem as well. A damp or rainy spring is a common cause of chalk brood.

Treatment and prevention of chalk brood are pretty straightforward and include destroying infected combs and making sure that equipment is clean before use, between hives, and after use. You may also find that you will need to re-queen.

Bacteria

Bacterial problems can also plague your hives. A few of the more common bacterial problems are as follows.

American foul brood is caused by the larvae of a spore-forming subspecies of *Paenibacillus*. It is the most widespread and destructive of the existing bee brood diseases.

Young honeybee larvae that are less than 24 hours old are the most susceptible to the infection, but larvae up to three days old can remain at risk of infection through the ingestion of spores in their food. However, the spores will die in larvae that are over three days old in age.

Infected honeybee larvae will die after being sealed in their cell by nurse drones. Also, although the vegetative form of the bacteria will die with it, it will first produce millions of spores, with each dead honeybee larva containing up to 100 million spores. Although these bacteria affect only the honeybee larvae, they can be deadly to the entire brood.

Unfortunately the Paenibacillus larvae are visible only under a high-powered microscope; however, the method of treatment response is pretty straightforward with the shook-swarm method.

The shook-swarm method is simply shaking the adult bees from an old set of frames into a new hive. Originally used as a way to control swarming, the shook-swarm method can also be used to replace a brood comb in order to reduce an existing problem with disease or reduce the risk of disease.

European foul brood *(Melissococcus plutonis)* is a bacteria that infects the midgut area of the honeybee larvae. European foul brood is much less deadly to a colony or hive than the American foul brood. However, though it does not form spores as the American variant does, the European brood *can* survive the winter.

European foul brood is often considered a stress-related disease, meaning that it would usually be dangerous only to an already stressed hive, one which is either undergoing a preexisting infection or struggling to find adequate food resources. A healthy hive will usually survive its encounter with the bacteria.

Symptoms of European foul brood include dead and/or dying larvae that will appear as they are curled upward with a brown, yellow, melted, or deflated look. The tracheal tubes may also be dried and rubbery.

As with American foul brood, the best treatment for European foul brood is the shook-swarm method, followed by thoroughly cleaning the old hive.

A final example is stone brood. **Stone brood** is a bee brood disease caused by the fungi *Aspergillus flavus, Aspergillus fumi gatus*, and *Aspergillus niger*. Stone brood affects both sealed and unsealed broods. Although it is rare and not as serious as other brood diseases, it should be noted that this fungi can also cause respiratory disease, not only in other animals, but in humans as well.

It can be difficult to identify stone brood when the fungi are in their early stages, but (unfortunately) the fungi are rapid growers. They will then show a whitish-yellow ring near the head of the infected larvae. The larvae may also be covered in yellow-green, gray-green, or black, powderlike spores, with the color of the spores depending on which of the strains that you are dealing with. They cause mummification of the brood, and the spores can overrun and fill the cells that contain the infected larvae.

Spores are common on moldy hay, as well as being present in soil. The spores can also spread through foodstuffs, contaminated equipment, by robber bees, and swarming. Both robber bees and swarming can carry spores from place to place.

Checking for evidence of stone brood basically requires examining brood frames and floor debris, again, using shook-swarm. As the bees are gently shaken from the frame, it is easier to spot the problems. Mummies can be spotted easily, and may even fall out of their cells. Adult bees may tear the cappings off the dead larvae's cells as well.

Although treatment is nonspecific, increased ventilation and re-queening are two options. Proper management is also a great help. Similar to chalk brood, good practices include cleanliness (a stone brood can spread by using contaminated equipment), having the hives in a warm, dry location, and having strong colonies. It is also a good idea to remove any mummies and destroy combs with large numbers of mummies in them.

In the end, there are a number of diseases and parasites that can affect the colony or hive. While this discussion touches on only a few, it is a good idea for new beekeepers to try and familiarize themselves with those most common within their areas and regions.

Predators

As with any other livestock, there are also other predators that can go after a colony or hive. Although the worst predator that the honeybee can face is the aforementioned parasite, the varroa mite, insects, spiders, reptiles, amphibians, birds, and some mammals can also pose a threat to honeybee colonies and hives.

The following are a few examples of threats that prey on the honeybee. Although we will not get as in depth as with diseases and parasites, this will give you a good idea of a few of the common predators that you may face with your bees. Some may be difficult to prepare for, while others may have simple, common sense solutions.

Wasps and hornets can be difficult to control, and the results of their preying on honeybees are significant.

In tropical areas, **ants** can destroy entire colonies, and their work can be quick. In trying to get a handle on these predators, it is suggested that you visit local extension offices or even pest-control companies so you can review your particular situation, and they can give you the safest way to remove the threat from your bees.

Frogs, toads, and lizards can also be problems for your hives, although their potential for damage is minimal compared to others. The threat can be easily eliminated, or at least reduced, by simply eliminating standing boards from the hives.

There are some mammals that will also prey on your hives. The two most common predators that will be briefly touched on are skunks and bears.

Bears can tear hives apart. Contrary to popular (and storybook) belief, the bears are actually going after the fat and protein rich pupae, larvae, and eggs in the brood comb and not the honey, although they will eat the honey. Also, the bears do get stung in the process, but, when they are done, they will shake the bees off as they walk away from their mess.

While your fencing may be able to help some, it is still a good idea not to keep hives at the edges of woods, especially when bears are known to live in your area. Although it will not totally prevent bears from invading your hives, they may be less likely to come after your bees if they are away from the woods.

Another mammal that preys on honeybees and is even more common than the bear is the skunk. **Skunks** can destroy an entire hive in only a few nights.

A skunk will approach the hive and scratch on the front of it. In turn, the workers that are on guard duty will come out and check to see what is going on. As soon as a few guards step out, the skunk will devour them. As each wave of guards comes out to check, they will be caught and devoured as well. If the skunk finds the hive easy pickings (if the placement of your hive is easy to reach without being too close to human habitations), it will continue to come back to the hive until it has emptied the hive of the bees. Then, when the

bees are gone, the skunk will go after the honey, wax, and pollen if it can find its way into the hive without too much difficulty.

Fencing will go a long way to keep out a skunk. Chicken wire will work well. Choose some that will be strong gauge, but with small openings, like one and a half to two inches. As skunks will dig, any fencing should be sunk at least eight to twelve inches down, or they may dig under the fence and get to your hives anyway.

This has been just a brief overview as to what can go after your bees and how to take care of (or at least control) the problems, keeping your bees and honey safe.

CHAPTER 11

A YEAR IN BEEKEEPING

One more element to consider when determining the ease with which you can keep your honeybees is the seasons. Whether you live in a cold, cool, or tropical climate, there will be seasonal weather issues.

On the whole, weather conditions can both help and hinder your beekeeping efforts, even to the point of encouraging or killing parasites and disease. Now, let us look a little further at the seasons and how they can affect the colonies and beehives.

Winter

Winter is the hardest time of the year for your bees and is the time when they can suffer the most losses. Bees can even get hypothermia. While the season, with its cold temperatures, snow, and ice (in many areas), can take its toll on a hive, many problems are also due to the mistakes of the beekeeper.

One major mistake the beekeeper can make is not leaving the bees enough honey to sustain them throughout the winter. Although we have discussed that supplemental food may be left for the bees, the irrefutable truth is that there is nothing better for your hive than its own honey, especially in the winter. The number to remember is

that between 60 and 80 pounds of honey left in the hive should suffice (some even say up to 90 pounds).

Another problem that can cause harm to your bees is bad ventilation in the hive. Warm air from the hive meeting the cold surface of the hive's roof forms ice, which, in turn, melts back into water as it warms up. The water then drips back into the hive, creating a wet hive. While the installation of a top hive entrance will usually solve this problem, the hive still needs proper ventilation regardless.

Still another problem is failing to check for parasites and diseases in the fall. Left unchecked, this can cause a weak hive, resulting in further problems within the hive and colony in the spring.

After you have done your checks, cover hives if necessary. (This will depend on the region you are in. It will not be necessary in tropical or temperate areas, where severe winters are mild or nonexistent.)

As a brief note on honeybee characteristics, it is worth mentioning that bees do not hibernate for the winter. They cluster in the hive. Generating heat by vibrating their wing muscles (without moving their wings), the bees cluster to keep warm. If there is a brood in the hive, the adult bees will cluster around it, keeping the brood warm as well. During this time, any drones left will be forced out to conserve food. While the honeybees will normally retreat to their hives for the winter, do not be surprised if you see some out flying around on unusually warm winter days.

Spring

Spring can be unpredictable because, at this time, especially in early spring, the weather and temperature are still changing frequently and unpredictably. However, it is also the time to perform a few necessary chores with the hive.

Spring can be a good time to split your hives. Splitting the hive will reduce the colony size and will hopefully discourage swarming due to lack of space. Splitting also helps with mite control, as it

gives the beekeeper the chance to do a hive inspection. It also allows an increase in the number of hives for honey production. Also, depending on how much honey is left in the stores, and depending on where you are, you may need to offer your colony supplemental food until the pollen and nectar are once again fully accessible to the honeybees.

As far as splitting a hive, it is basically like splitting a plant. When you have too many plants in a pot, you need to remove some and put them in a new pot. In much the same way, when your hives begin to get overcrowded, it is to the benefit of beekeepers and their bees to split the hive. Do not forget that you will also need to queen the new hive.

Summer

With summer and its hot, hot days, the colony will need and use a lot of water: an average of a quart to a gallon of water per day, depending on temperature and hive size.

While the bees may find water for themselves in nearby lakes, ponds, rivers, springs, and even in temporary puddles, you may also want to create water sources for them by leaving water dishes near the hive or in the garden. Do not forget to add something for the bees to stand on so they cannot drown. If you have a soaker hose going in your garden, I have found that the bees will use this as a water source as well. It actually works perfectly for them.

Ventilation is also very important in the hives. Screen bottom boards and ventilation openings in the bottom will help aid air circulation. However, if the hive still gets so hot that you notice the beeswax melting, you will need to allow for some shade as well as ventilation.

As far as working with your bees and anticipating their temperament, this is basically their time to go out and do what they do, which is hunt, forage, and create honey, while going about their daily hive chores.

It should be noted that, if you live in a warm or tropical climate, you will probably be doing some of the summer chores a bit more often and for a longer period of time than a beekeeper who has a hive in a more temperate or cool climate.

Fall

Fall is usually honey harvest time. Yet remember to leave enough so the bees can survive the winter. If you think that the bees will not have enough honey for their winter stores, then do not harvest any honey for yourself or for market from that particular hive. This is also the time to once again check and treat for disease and parasites.

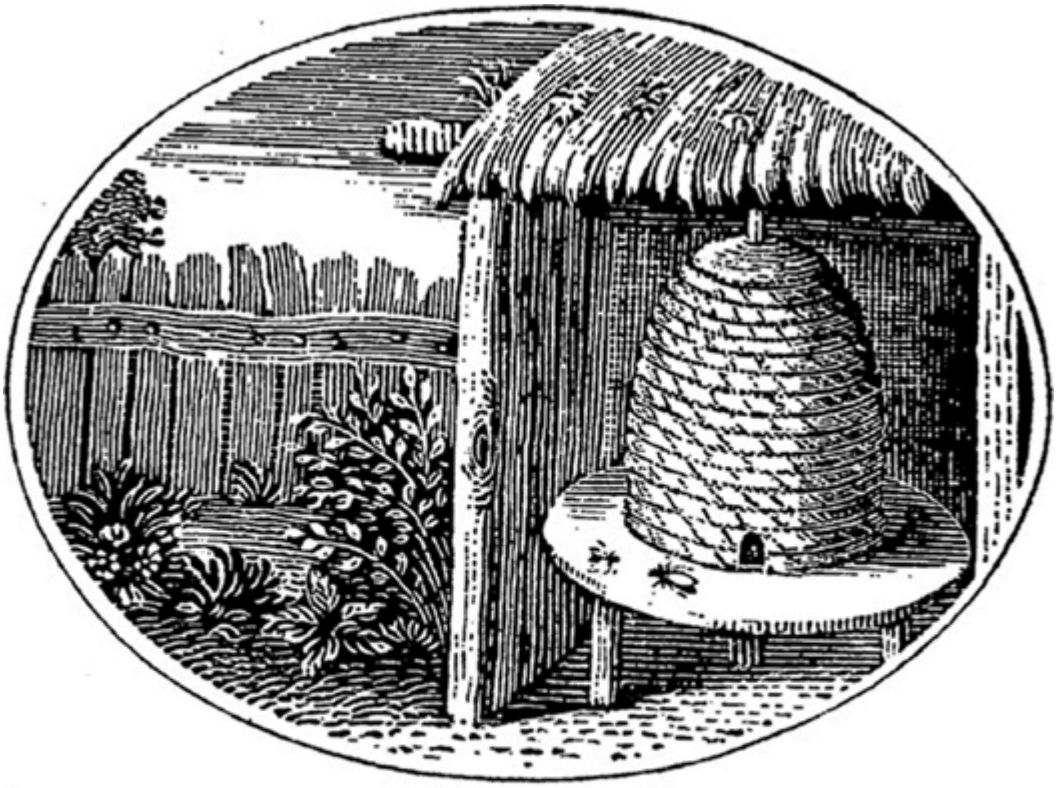
Preparation for the winter should begin at this time. Efforts such as reducing the hive entrance (making the hive entrance smaller), making sure there is proper ventilation, and installing mouse guards so mice cannot get into the hives during the winter will help your colonies through the season.

You will find that the queen will stop laying in late fall/early winter. This is due to her limited food stores, as the workers focus on insulating their hive. Again, any drones still in the hive at this time will be driven out of the hive to preserve the limited food stores that the colony will have for the winter.

Fall is also the time that some beekeepers will re-queen if the hive's queen is in her second season or has not been laying well. This preventative practice is due to the fact that she may have as little as a 50-percent chance of surviving the winter at this age. However, this should be done on a case-by-case basis, as you will know your hives and your bees best.

Although there are other jobs that will pop up with the seasons, as well as unexpected things (good and bad), this brief overview of the seasons gives you an idea as to what to expect. It may be easier to keep a yearly calendar of what you need to do with your bees, especially for your first few years with the honeybees, until you are

comfortable with your monthly routine. Just remember that it is always subject to change.



CHAPTER 12

BEES, HONEY, AND ALLERGIES

As helpful and as necessary as bees are, and as healthy as honey is, some people are allergic, even deathly allergic, to one or both. At the same time, honey can actually help other people with their allergies, and bee stings can be therapeutic to someone with severe arthritis. Yet why?

First, let us look briefly at why bee stings can be both deadly and therapeutic.

Bee Stings

Bee stings are a part of life, yet some people are much more affected by them than others. Most of the population would have some pain and a little swelling after a bee sting, perhaps extending to nausea, which, while not life threatening in itself, can be a clear sign of more serious complications. Others may experience more severe reactions ranging from life-threatening situations such as tongue swelling, breathing difficulties, and the worst-case scenarios of anaphylactic shock and cardiac arrest.

Approximately two million people in the United States are allergic to bees, with approximately 50 deaths per year. You actually have

higher odds of death by lightning or flu than by a bee sting. So, for those who are allergic, why is it so?

Those who are allergic to bee stings are actually allergic to the venom the bee produces, not the stinger or even the bee. This is due to the body producing antibodies to the venom's allergen. In turn, the antibodies react, producing chemicals and histamines, which can then cause swelling of glands, membranes, and cells.

Some people do not even know that they are allergic to bee stings until they get stung. On the other hand, some people may have no reaction at all the first time or two (or even three times) they get stung; then, all of a sudden, they can show signs of allergies or have a severe reaction.

One of the most common things used to treat someone with bee-sting allergies when stung is an epinephrine injection. However, some people have also built up a tolerance through small, then, later, larger doses of the venom itself, with boosters afterward. Most people, though, carry the injection kits with them in case of a sting. This gives them time to get to a doctor or hospital.

There are also several home remedies for bee stings. A few examples are:

- Covering the sting with honey and reapplying as necessary for the pain
- Using aloe-vera gel on the sting
- Using apple-cider vinegar on the sting
- Crushed lemon-balm leaves
- Making a paste of baking soda and water, and then applying to the sting

I have also found (firsthand) that if you are outdoors and are near some mud, placing some on the affected area can also help to soothe the sting.

There are a number of other home remedies available, but, before you use any, it is recommended to read further about them. Also, if you show any signs of an allergic reaction or know that you are allergic to bee stings, get to a hospital immediately.

Finally, there is one thing to remember: when you are stung, the faster you can remove the stinger, the less venom will be released into your body.

Honey Allergies

Can someone be allergic to honey? Sure, just like any other food. Symptoms include runny nose, swelling of the lips and/or tongue, itchy throat, and hives, among other reactions. As with bee stings, the worst-case scenario can also be anaphylactic shock. Allergies to honey can lead to weakened immune systems or infection, too. Treatment usually includes an antihistamine when symptoms start.

The good news is that, if you *are* allergic, honey is easy to avoid. It is still not used in food preparation nearly as much as sugar, and, many times (although not always), products are labeled up front as being made with honey. However, as with any other allergy, it is important to check the ingredient list, or, if at a restaurant, just ask. One interesting fact: it is quite possible to be allergic to bee stings, but not honey.

Also, please note that honey should not be fed to children less than one year of age, due to the risk of botulism. This is because, at this age, their immune systems are not developed enough to fight the botulism spores from the dust and dirt that often make it into the honey.

Apitherapy and Honey for Allergies

On the other side of the coin, bee stings and honey can be therapeutic. First, let us look at the basics of apitherapy.

Apitherapy, also known as bee-sting therapy, is a folk remedy that has been used in many countries for centuries and is today considered a homeopathic remedy. Used by historic figures such as Alexander the Great and Charlemagne (who supposedly used it to cure his gout), today, bee-sting therapy has been used for arthritis, multiple sclerosis, Lyme disease, and carpal tunnel, among other ailments.

The bee's venom, which is the source of the sting's healing properties, is a rich source of enzymes and biogenic amines, along with a number of other components with pharmaceutical properties. Although it is still unknown as to why the venom works the way that it does, it is believed to modify how the immune system functions, as well as contributing to an increased production of cortisol.

Traditionally, live bees have been (and are still) used to sting and inject venom into the affected area or areas. However, the venom can also be injected through applying creams or ointments directly to the ligaments, but it is said that using the sting method, which supplies pure venom, is the best method.

It should be noted that bee-sting therapy needs to be done under the care of a doctor or other licensed practitioner, due to the risk, albeit slight, of an allergic reaction.

Honey can also help in dealing with seasonal allergies and to help alleviate symptoms. Many people say that they can fight their allergies with the help of local honey. Due to the fact that the honey is likely to be produced by bees in the area where the allergy sufferer lives, the honey is said to help build immunity to the local pollen.

However, research on this subject is divided. Some researchers and medical professionals say that local honey does not work in helping to combat seasonal allergies. Others say the complete opposite. Among those individuals who are actually trying it or have used it, though, many say that it does help.

The typical recommendation for those using local honey for allergy relief is one teaspoon per day, starting a few months before pollen/allergy season begins in order to allow the system to build up immunity.

If you are considering trying local honey for allergy relief, remember that, in some cases, honey *can* cause a severe allergic reaction. So, if you know or think that you may be allergic to honey, do not use it.

CHAPTER 13

COLONY COLLAPSE

Something that has been causing mayhem in the honeybee world is the phenomenon of colony collapse. Although it is uncertain exactly what is causing this disorder, it has been having a devastating effect on the honeybees, including those in apiaries, worldwide.

Colony Collapse Disorder, also known as CCD, occurs when worker bees disappear without warning or apparent cause. Known to have been around since as early as the 1900s, when it was first observed, it was called the “mystery disease” or the “disappearing disease.” In 1906, during an outbreak of CCD in the United Kingdom, the cause was later attributed to a combination of weather, inadequate foraging, and an underlying chronic bee-paralysis virus.

From there, it has continued to occur throughout the years, but has recently become a much bigger concern. It was not until 2006/2007, when losses grew to significant numbers in North America, that it became known as Colony Collapse Disorder. Besides North America, CCD has also invaded the Netherlands, Italy, Belgium, Greece, Spain, France, and Portugal, along with possible problems in Switzerland and Germany. Almost one third of the hives in the United States have been lost due to CCD.

Possible causes of CCD include, but may not be limited to:

- Varroa mites
- Disease
- Stress due to environmental change
- Pesticides
- Malnutrition
- Genetically modified crops
- Cell-phone towers

Although the last two are just theories, some claim to have proof that they are affecting the bees, though no such proof has of yet been widely accepted. One prominent theory for the decrease in honeybee population suggests that the limited genetic base of commercial bees has left them more susceptible as a group to certain threats and diseases.

However, it is most likely that CCD is caused by a combination of problems, which seems to be the theory that many are leaning toward.

Although no one knows for sure what the cause is, CCD does have symptoms, which include abandoned hives with capped broods, few to no workers with the queen still in the hive, still a presence of food in the hives, not enough workers, or all the workers that are there are young.

However, should you find dead bees, it does not mean your hives have become victim of CCD, especially if those bees are found outside of the hive. However, as this may be a sign of poisoning by pesticides, so it is certainly a cause for concern.

Disappearance due to CCD has also been affecting feral or wild honeybees. However, those keepers who are using organic practices with their beekeeping claim to be little affected from CCD, due to the fact that their bees are kept without the use of pesticides to control problems, and that the keepers are, instead, trying to mimic

more natural keeping. Also, it does appear to be true that organic honeybees do not seem to have the stress factor.

Although little is known about this devastating problem, beekeepers and researchers are diligently trying to find a definitive reason or reasons behind CCD, with the hopes of controlling or eliminating it in the near future.

FINAL NOTES

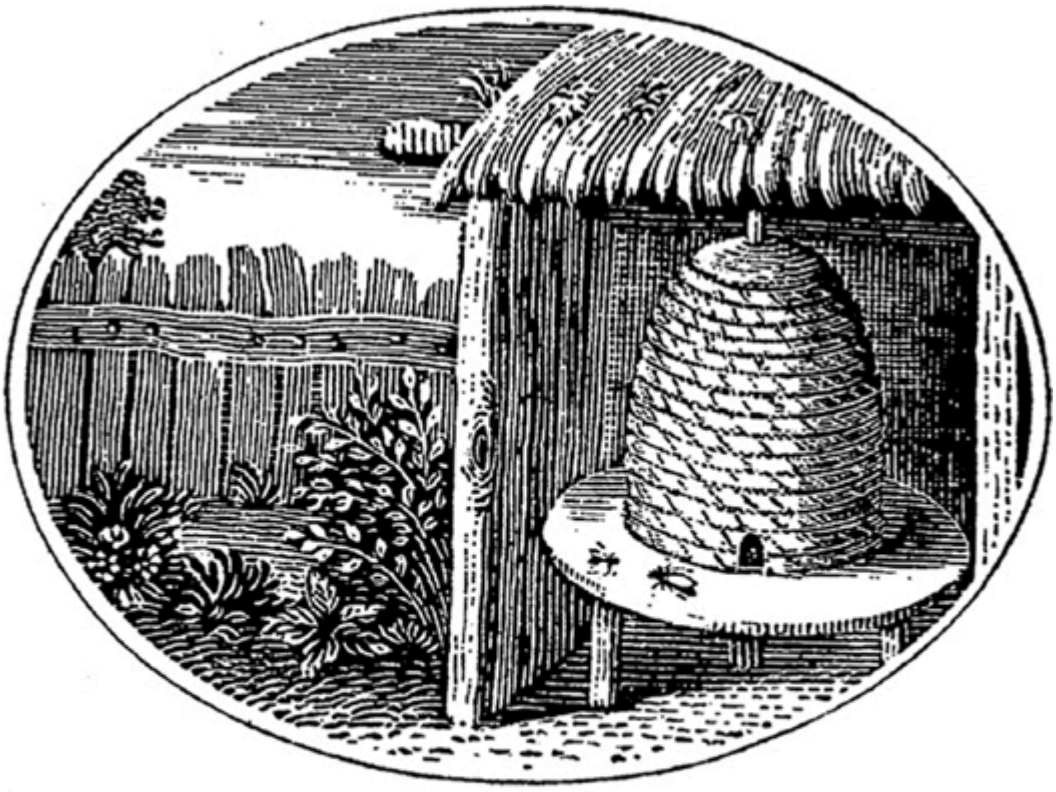
The honeybee is an amazing feat of nature that packs a lifetime into a few weeks. They are extremely well organized, with every one knowing its place and job from birth, and they produce one of the healthiest foods in the world. They are also important to our own food supply, and for that alone they deserve our respect and admiration.

The purpose of this book is just to scratch the surface of these fascinating insects, and is meant only to give prospective beekeepers a window into the world of the honeybee. Should you decide to pursue keeping honeybees, you will be entering into a fascinating, self-contained society that will quickly catch you up in the magic of the honeybee.

Enjoy!

FUN FACTS

- Aztec and Mayan carvings are full of bees, honeycombs, and pollen.
- Ancient cave paintings show that the practice of honey collection and beekeeping dates as far back as the Stone Age.
- When substituting honey for cooking, substitute ¾ cup of honey for each cup of sugar. Reduce other liquids by ½ cup for every cup of honey used (this is due to the added moisture the honey will provide).
- Honey can help keep baked goods moist and fresh when used as one of the ingredients.
- Honey can range in color from white to golden or dark brown. The darker the color of the honey, the stronger the flavor.
- In the United States, approximately one-third of all the food that we eat is derived from honeybee pollination, whether directly or indirectly.
- The population of a colony of honeybees typically peaks in mid-summer, and can reach 60,000 to 80,000 bees per colony.
- Honeybees contribute over $14 billion to the value of American crop production.
- A colony of honeybees (around 30,000 bees) can pollinate one acre of fruit trees.
- A bee's brain is only about the size of a sesame seed, yet it has an amazing capacity to learn and remember things, and can make complex calculations in regard to distance and foraging efficiency.



RECIPES

I would like to thank the National Honey Board (www.honey.com) for use of their recipes for this book.
(All recipes courtesy of the National Honey Board.)

Honey Yogurt Dumplings with Apples

Dumpling Batter:

1 cup all-purpose flour

4 teaspoons baking powder

1 teaspoon ground cinnamon

⅛ teaspoon salt

1 egg

6 tablespoons low-fat plain yogurt

1 tablespoon honey

1 tablespoon 2% low-fat milk

1 teaspoon grated orange peel

Apple Mixture:

4 cups apple slices

2 cups cranberry juice

½ cup honey

1 cinnamon stick or ¼ teaspoon ground cinnamon

¼ teaspoon ground nutmeg

Combine flour, baking powder, cinnamon, and salt in a large bowl. Mix together egg, yogurt, 1 tablespoon of honey, milk, and orange peel in a separate large bowl; stir into the flour mixture to form a moist batter. Combine apples, juice, the remaining ½ cup of honey, cinnamon stick, and nutmeg in a heavy, large skillet; mix well. Bring to a boil over medium-high heat. Reduce the heat to low. Drop tablespoonfuls of batter over the hot apple mixture. Cover and simmer for 15 to 20 minutes or until the dumplings are cooked through and a wooden pick inserted near the dumplings' centers comes out clean.

Bee Berry Sorbet

1 package (16 oz.) frozen raspberries

¼ cup honey

¼ cup fresh lime juice, including pulp

½ teaspoon grated lime peel

1 cup water

Puree raspberries in blender or food processor. Strain through fine strainer using spoon to press puree through strainer into medium bowl. Add remaining ingredients; mix well. Pour into canister of ice cream maker. Freeze according to manufacturer's directions.
Freezer Method: Pour raspberry mixture into 9-inch freezer-safe pan. Place in freezer for 3 to 6 hours or until firm. Transfer mixture to mixer bowl. Beat with an electric mixer until slushy but not thawed. Return to pan and freeze for 2 to 4 hours or until firm.
Makes 6 servings.

Honey Almond Biscotti

½ cup butter or margarine, softened

¾ cup honey

2 eggs

1 teaspoon vanilla extract

3½ cups all-purpose flour

2 teaspoons anise seeds

2 teaspoons ground cinnamon

½ teaspoon baking powder

½ teaspoon salt

¼ teaspoon baking soda

1 cup dried cranberries

¾ cup slivered almonds

Using an electric mixer, beat butter until light; gradually add honey, eggs, and vanilla, beating until smooth. In a small bowl, combine flour, anise seeds, cinnamon, baking powder, salt, and baking soda; gradually add to the honey mixture, mixing well. Stir in cranberries and almonds. Shape dough into 2 10-by-3-by-1-inch logs on a greased baking sheet. Bake at 350˚F for 20 minutes or until light golden brown. Remove from the oven to a wire rack; cool for 5 minutes. Reduce the oven to 300˚F. Transfer the logs to a cutting board. Cut each log into ½-inch slices; arrange on a baking sheet. Bake for 20 minutes or until crisp. Cool on wire racks.

Linguini with Honey-Sauced Prawns

1 pound prawns, peeled and deveined

½ cup julienned carrots

½ cup julienned celery

½ cup diagonally sliced green onions

3 cloves garlic, minced

2 tablespoons olive oil

½ cup water

¼ cup honey

4 teaspoons cornstarch

1 teaspoon salt

¼ teaspoon crushed red pepper flakes

¼ teaspoon crushed dried rosemary leaves

1 pound cooked linguine pasta, kept warm

Stir-fry prawns, carrots, celery, green onions, and garlic in oil in a large skillet over medium-high heat for about 3 minutes or until the prawns start to turn pink. Combine the remaining ingredients (except pasta) in a small bowl; mix well. Add to the prawn mixture; stir-fry for about 1 minute or until the sauce thickens. Serve over pasta.

Honey Barbecue–Glazed Salmon

2 large onions, sliced

2 cups dry white wine

2 cups tomato juice

1 cup ketchup

½ cup honey

⅛ cup Worcestershire sauce

1 teaspoon garlic, chopped

1 teaspoon chili powder

Salt and pepper, to taste

8 Alaska salmon steaks (6 ounces each)

Combine onions and white wine in a medium saucepan. Bring to a boil over medium-high heat. Add the remaining ingredients (except fish) and stir well. Reduce the heat to low and simmer for 1 hour; remove from the heat and puree in a blender or food processor; set aside. Place salmon steaks in a lightly oiled baking pan and baste with the sauce. Bake in a preheated, 425°F oven for about 6 minutes; turn and baste. Bake until the fish just flakes when tested with a fork.

Balsamic Onions with Honey

3 large red onions (about 3 pounds)

1 tablespoon plus ¼ cup water

6 tablespoons honey

¼ cup balsamic vinegar or red-wine vinegar

3 tablespoons butter or margarine, melted

1 teaspoon paprika

1 teaspoon ground coriander

½ teaspoon salt

⅛ teaspoon ground red pepper

Peel onions and cut crosswise into halves. Place cut-side down in a shallow baking dish just large enough to hold the onions in a single layer. Sprinkle with 1 tablespoon of water; cover with foil. Bake at 350°F for 30 minutes. Combine honey, vinegar, the remaining ¼ cup of water, butter, paprika, coriander, salt, and red pepper in a small bowl. Remove the onions from the oven and turn cut-side up. Spoon ½ of the honey mixture over the onions. Bake uncovered for 15 minutes more. Baste with the remaining honey mixture; bake for 15 minutes more or until tender.
Serving Suggestion: Serve with poultry or pork.

Creamy Honey-Sesame Dip for Vegetables

¾ cup nonfat mayonnaise

¼ cup rice vinegar

¼ cup honey

3 tablespoons toasted sesame seeds

1 tablespoon grated fresh gingerroot

1 small clove garlic, minced

¾ teaspoon oriental sesame oil

⅛ teaspoon crushed red pepper flakes

Salt, to taste

Whisk together mayonnaise, vinegar, and honey in a small bowl. Add the remaining ingredients; mix thoroughly. Dip may be stored tightly covered in a refrigerator for up to 1 week.
Serving Suggestion: Serve with assorted fresh vegetables.

Honey Lemonade with Frozen Fruit Cubes

1½ cups lemon juice

¾ cup honey

9 cups water

28 small pieces assorted fruit

Combine lemon juice and honey in a large pitcher; stir until the honey is dissolved. Stir in water. Place 1 to 2 pieces of fruit in each compartment of 2 ice-cube trays. Fill each compartment with honey lemonade and freeze until firm. Chill the remaining lemonade. To serve, divide the frozen fruit cubes among tall glasses and fill with the remaining lemonade.
Makes 28 Frozen Fruit Cubes.

Spiced Honey Butter

(Recipe developed by Carol Stevens, Red Star Yeast and the National Honey Board.)

½ cup butter or margarine, softened

¼ cup honey

1 teaspoon grated orange peel

½ teaspoon ground cinnamon

Combine all ingredients and mix well.
Serving Suggestion: Serve with biscuits, bread muffins, or scones.

Bee Birthday Cake

Cake:

Cooking spray

All-purpose flour, for dusting pans

2 cups white whole-wheat flour, sifted

2 teaspoons baking powder

1½ teaspoons cinnamon

¼ teaspoon baking soda

¼ cup butter, softened

2 eggs

1 cup honey

1 teaspoon vanilla

⅔ cup 1% milk

Frosting:

8 ounces cream cheese, softened

¼ cup honey

½ teaspoon vanilla extract

Cake:

Heat an oven to 350˚F. Spray two 8-inch cake pans with cooking spray and dust with all-purpose flour. Whisk together whole-wheat flour, baking powder, cinnamon, and baking soda. In a stand mixer with a paddle attachment with electric beaters, cream butter on medium speed until light and fluffy. Add eggs 1 at a time, mixing well after each addition. Add honey and vanilla, and beat until smooth. On low speed, add the flour mixture to the mixer alternately with milk, starting and ending with the flour mixture,

and mixing just until blended. Portion the batter into prepared cake pans, dividing it evenly. Bake for 20 to 25 minutes or until the top of the cake springs back when lightly pressed. Cool the cake in pans for 15 minutes; unmold onto a rack and cool completely.

Frosting:
Beat cream cheese, honey, and vanilla until light and fluffy. Spread ½ of the frosting onto one layer, place a second layer on top, and spread the remaining frosting on top. If the frosting is soft, refrigerate for about 30 minutes or until the frosting starts to firm up; cut into 10 pieces.

Grilled Portobello-Mushroom Salad with Greens, Honey Vinaigrette, and Roquefort

⅓ cup honey

¼ cup balsamic vinegar

3 tablespoons soy sauce

2 cloves garlic, coarsely chopped

⅓ cup olive oil

4 (3 to 4-inch) portobello mushrooms, cleaned with stems removed

¼ cup bacon, chopped (or 1 ounce cooked bacon bits)

8 cups mixed baby greens

Honey Vinaigrette (recipe follows)

½ cup crumbled Roquefort or blue cheese

Snipped chives, for garnish

To make Honey Vinaigrette: In the container of an electric blender, blend honey, vinegar, soy sauce, garlic, and ¼ cup of oil until smooth; set aside.

Brush mushrooms on both sides with 1½ tablespoons of oil; place on an indoor grill or in a preheated nonstick skillet over medium-high heat. Cook for about 5 minutes, turning occasionally just until tender. Transfer to a nonreactive container gill-sides up. Pour the marinade over the mushrooms; cover and refrigerate for 2 to 4 hours, basting with marinade occasionally. If using raw bacon, sauté the bacon until lightly browned. Remove to paper towels to drain; set aside. Drain, and then reheat the mushrooms for 1 to 2 minutes on an indoor or outdoor grill, turning once. In a large bowl, toss greens with ⅓ cup (or to taste) of Honey Vinaigrette. Divide the greens equally among 4 individual serving plates. Halve the mushrooms. Prop ½ of the mushrooms on the others on each salad.

Divide the cheese and cooked bacon bits among the salads. Sprinkle with chives.

Chewy Monkey Bars

3 cups miniature marshmallows

½ cup honey

⅓ cup butter or margarine

¼ cup peanut butter

2 teaspoons vanilla

¼ teaspoon salt

2 cups rolled oats

4 cups crispy rice cereal

½ cup flaked coconut

¼ cup peanuts

Combine marshmallows, honey, butter, peanut butter, vanilla, and salt together in a medium saucepan. Heat the mixture over low heat, stirring constantly. In a 13-by-9-by-2-inch baking pan, combine oats, rice cereal, coconut, and peanuts. Pour the honey mixture over the dry ingredients. Mix until thoroughly coated. Pack the mixture firmly into the pan. Cool and cut into 24 bars.

RESOURCES

Books

Aebi, Ormond, and Harry Aebi. *The Art & Adventure of Beekeeping. Santa Cruz, California: Unity Press, 1975*.
Cale, Gladstone Hume. *Beekeeping for Beginners. Carthage, Illinois: Hancock County Journal, 1949*.
Kelly, Walter T. *How to Keep Bees and Sell Honey. Clarkson, Kentucky: Walter T. Kelly Co., 1958*.
Beekeeping. New Brunswick, New Jersey: Boy Scouts of America, *1957*.

Periodicals

Countryside Magazine (www.countrysidemag.com)
One of the first in self-sufficiency. Lots of articles on beekeeping.

Mother Earth News (www.motherearthnews.com)
One of the first magazines for those interested in homesteading and self-sufficiency. A variety of articles about bees and beekeeping, including their upkeep and use.

Acres U.S.A.: "A Voice for Eco-Agriculture" (www.acresusa.com)
Excellent magazine for sustainable and organic farming. Lots of articles for the small and backyard farmer.

Organic Gardening Magazine (www.organicgardening.com)
Magazine for the organic gardener and small farmer. Covers rural, suburban, and urban, all across the country. Includes occasional articles about bees, honey, and its uses.

Bee Culture: The Magazine of American Beekeeping (www.beeculture.com)
Focuses entirely on beekeeping for both the hobbyist and small commercial beekeeper. Covers rural, suburban, and urban beekeeping.

Websites

New Century Homestead (www.newcenturyhomestead.com)
Workshops and programs. Feel free to contact with questions on any aspect of backyard farming.

HolisticMD (www.holisticmd.org)
Website for holistic medicine. Includes information on bee-venom therapy.

Center for Ecological Apiculture (www.thiele-und-thiele-consult.de)
Excellent information on beekeeping. German site in English.

BeePollenBuzz.Com (www.bee-pollen-buzz.com)
Excellent site for information on royal jelly and its uses.

WebMD (www.webmd.com)
Online medical information site.

www.drgrotte.com
Has excellent information on honey as medicine.

www.honeyo.com
Various information on bees, beekeeping, and honey.

Honey Bee Suite (www.honeybeesuite.com)
Excellent general bee information.

The Hive and the Honeybee (http://bees.library.cornell.edu)
Excellent general bee information.

E. F. Phillips Beekeeping Collection (http://westmtnapiary.com/bee_diet.html)
Great information on a bee's diet.

www.biobees.com
This website has lots of bee information, including plans on building one style of beehive.

MadeGood.org
Plans for frames.

beespace.net
Information site and hive plans.

Buzz About Bees.net
Free hive plans.

www.beethinking.com/top-bar-hives

Top-bar hive plans.

www.beethinking.com/warre-hives
Information on Warré hives.

www.buildingbeehives.com
Information website by Howland Blackiston, the author of Building Beehives for Dummies and Beekeeping for Dummies.

www.extension.org
Cornell University's eXtension site.

Apps
(The following apps are free of charge.)

Bee Smart- Pollinator Gardener
Enter your zip code, and a list will pop up of plants native to that area that will attract pollinators.

Beehive Manager
Keep track of your hives and their locations if you are keeping them somewhere other than your own home.

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