

HONEY BEE 101





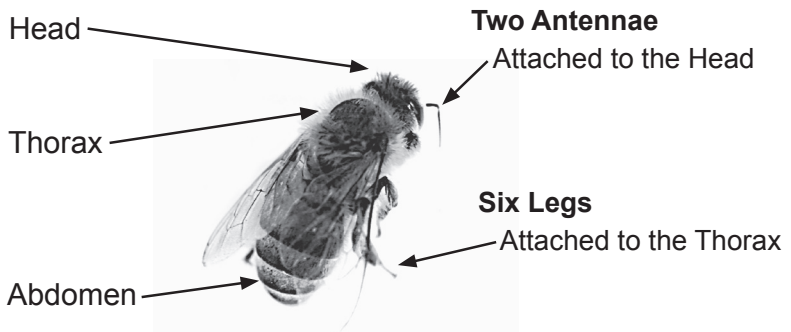
Chapter 1

A Bee with Class

The honey bee belongs to the Class Insecta, which is part of the Phylum Arthropoda. Thus, the honey bee is an insect and the honey bee is also an arthropod. As an arthropod, the honey bee has an *external* skeleton known as an *exoskeleton*, as opposed to the *internal* skeleton that supports ourselves and other vertebrates. As an insect, the honey bee possesses classic characteristics—two antennae, six legs, and three main body parts (the head, thorax, and abdomen that are reflected in the organization of this book). All insects—from giant water bugs and wasps to ladybird beetles and dragonflies—are arthropods, but not all arthropods (which include spiders, barnacles, and crayfish) are insects.

Characteristic Trappings of an Insect

Three Main Body Parts



The honey bee is an insect and thus shares certain characteristics with all other insects: two antennae, six legs, and three main body parts—head, thorax, and abdomen.

Classification

Early on, we make distinctions in the world around us along the lines of Plant, Animal, Mineral. In doing this, we are using a system of classification. Biologists use a system in which all organisms are described according to Kingdom, which similarly includes broadly defined plant and animal distinctions. A total of five Kingdoms are generally accepted today.

Both the honey bee and the human being are described as animals and thus belong to the Kingdom Animalia. Our differences become more apparent as we move to more-specific levels of classification. For example, we are grouped with animals that have a spinal cord (Chordata), whereas the honey bee is grouped with animals that have an external skeleton (Arthropoda). Once a grouping is made at a particular level of classification, there's no "going back." Rather, the grouping continues through successive levels all the way to species and sometimes beyond—for example, to subspecies.

The common name of the species *Apis mellifera* is the European honey bee or the Western honey bee. The subspecies of *Apis mellifera* most commonly kept in the northern hemisphere today are:

Apis mellifera carnica—the Carniolan honey bee

Apis mellifera caucasica—the Caucasian honey bee

Apis mellifera ligustica—the Italian honey bee

Apis mellifera mellifera—the Dark European honey bee/German honey bee

The Dark European honey bee *Apis mellifera mellifera* is often said to have been the first subspecies to arrive with European settlers in North America. The subspecies used for beekeeping have changed over time with importations, queen rearing, and artificial insemination of queens. Although others are kept, today a version of *Apis mellifera ligustica* is the most-kept subspecies in the United States.

These kinds of distinctions are important, because they are the basis for how the honey bee came to be named a bee and not a rhinoceros. At the level of organization known as the *Family*, the honey bee belongs to Apidae, which comprises a large number of different kinds of bees, typically with pollen baskets on their hindlegs. We distinguish the honey bee from other bees by the presence of specific characteristics, which are used to assign the honey bee to the genus *Apis*. Unlike other bees, those belonging to this genus characteristically store honey in surplus, more than is adequate to meet the needs of the colony. Just as the Family Apidae includes many kinds of bees and thus comprises a variety of known genera, the generic name *Apis* comprises bees that belong to a variety of known species. The focus here is on only one of these species, the one we know as *Apis mellifera*. It is the only *Apis* species now living in the United States.

Carl Linnaeus, the 18th-century taxonomist who devised the binomial nomenclature system (the two-name system that includes genus and species) for naming and then named many of the organisms we recognize today, was the person who named the honey bee. The name he gave the bee that is the subject of this book, *Apis mellifera*, essentially means the *honey-carrying* bee. Although the more accurate name *Apis mellifica*, which means the *honey-making* bee, was proposed a few years later, by tradition science has kept the first name. Even so, although we

Classification of the honey bee as it differs from that of the human being. Classification helps us understand relationships among organisms and communicate about them.

Level of Classification	Honey Bee	Human Being
Kingdom	Animalia	Animalia
Phylum	Arthropoda	Chordata
Class	Insecta	Mammalia
Order	Hymenoptera	Primates
Family	Apidae	Homonidae
Genus	<i>Apis</i> sp.	<i>Homo</i> sp.
Species	<i>Apis mellifera</i>	<i>Homo sapiens</i>
Subspecies*	<i>Apis mellifera carnica</i> <i>Apis mellifera caucasia</i> <i>Apis mellifera ligustica</i> <i>Apis mellifera mellifera</i>	<i>Homo sapiens sapiens</i>

*The numerous subspecies of *Apis mellifera*, four of which are indicated here, are grouped into two basic categories: temperate and tropical honey bees. The tropical subspecies include the African honey bee, which is classified as *Apis mellifera scutellata*.

***Apis mellifera* Subspecies**

Numerous subspecies have been described since Linnaeus named the species of honey bee we know as *Apis mellifera*. They are quite similar to one another and are able to mate; yet, because they were somewhat isolated in their own geographic locations over time, they have become distinct in differences they have developed in appearance, physiology, and behavior. It is fascinating that so much, the color of gold or black, the tendency to forage relatively early or later in the day, and even such things as a preference for avocado nectar, may be affected by genetics. The present subspecies are listed below with the name of the researcher who described them. The base subspecies, the one from which all others were first distinguished, retains the original species name as well as that of Linnaeus: hence, *Apis mellifera mellifera*, Linnaeus. Because the subspecies are able to mate with one another, honey bee colonies kept today are quite often hybrids. The subspecies include:

<i>Apis mellifera adami</i> , Ruttner	<i>Apis mellifera litorea</i> , Smith
<i>Apis mellifera adansonii</i> , Latreille	<i>Apis mellifera macedonica</i> , Ruttner
<i>Apis mellifera anatoliaca</i> , Maa	<i>Apis mellifera meda</i> , Skorikov
<i>Apis mellifera capensis</i> , Escholz	<i>Apis mellifera mellifera</i> , Linnaeus
<i>Apis mellifera carnica</i> , Pollmann	<i>Apis mellifera monticola</i> , Smith
<i>Apis mellifera caucasia</i> , Pollmann	<i>Apis mellifera ruttneri</i> , Sheppard
<i>Apis mellifera cecropia</i> , Kiesenwetter	<i>Apis mellifera sahariensis</i> , Baldensperger
<i>Apis mellifera cypria</i> , Pollmann	<i>Apis mellifera scutellata</i> , Lepeletier
<i>Apis mellifera iberiensis</i> , Engel	<i>Apis mellifera siciliana</i> , Grassi
<i>Apis mellifera intermissa</i> , Maa	<i>Apis mellifera syriaca</i> , Skorikov
<i>Apis mellifera jemenitica</i> , Ruttner	<i>Apis mellifera unicolor</i> , Latreille
<i>Apis mellifera lamarckii</i> , Cockerell	
<i>Apis mellifera ligustica</i> , Spinola	

value the honey bee for far more than the sweet substance we call *honey*, it is the making of honey that has secured the bond between ourselves and the honey bee since at least the days of the Stone Age.

Apis mellifera is a well-studied bee. It is the species used for much of the world's beekeeping. The classification of this bee continues from species to subspecies. Four of the more than twenty known subspecies of *Apis mellifera* are important for beekeeping in the northern hemisphere today. These four subspecies are among those that were originally introduced to the Americas. They are all *Apis mellifera* and can mate with one another, but they differ in some subtle and not-so-subtle ways.

Characteristics vary among the numerous subspecies of *Apis mellifera* because the subspecies have evolved in different environments over long periods of time. For example, *Apis mellifera carnica* tends to do relatively well at low temperatures, whereas *Apis mellifera caucasia* has a greater affinity than most for a sticky substance known as *propolis*, which is derived from the resinous secretions of certain plants.

The differences in characteristics follow patterns that allow us to further group the subspecies into two general categories: temperate honey bees and tropical honey bees. Typical of the differences exhibited between these two categories, for example, is the experience that the tropical subspecies tend to swarm more often and to be more aggressive in defending their colonies than the temperate subspecies.

Apis mellifera ligustica, the most commonly kept subspecies in the Americas today, is one of the temperate subspecies. Many of us are familiar with tropical subspecies as well; they include the African honey bee. In contrast to the naming of *Apis mellifera ligustica*, the African honey bee is classified as *Apis mellifera scutellata*.

Similar to European settlers who brought temperate subspecies with them for the making of honey, it was *us*—in this case, a researcher interested in increasing honey production—who brought pure African honey bee stock over. This subspecies met with an unfortunate release from the researcher's test site in Brazil in 1957. It was then that a beekeeper who was not familiar with the details of the research removed screens that had been placed on each beehive in the study; the screens were needed to ensure that the queen in each of the introduced colonies would not be able to leave her hive with a swarm, thus enabling the colony to reproduce—elsewhere.

When offered the opportunity with the removal of the screens that had blocked them from doing so, the colonies swarmed, indeed. As expected, they soon crossed with the European honey bee, and thereby produced the hybrid we call the *Africanized honey bee*. The Africanized honey bee has continued to spread

northward ever since. Given that we carried the African honey bee to the Americas, too, perhaps we might call ourselves the *bee-carrying human*.

Genetic analyses have shown that the genus *Apis* originated in Africa, as did we. Yet, the finding of an origin in Africa has come as a surprise to many honey bee enthusiasts. Most of the species belonging to the genus *Apis* are native to Asia, and this had led researchers over time to surmise that the genus originated in that part of the world. The *Apis* species considered in this book, *Apis mellifera*, moved well beyond Africa—to Europe as well as to Asia; it appears to have evolved in several distinct lineages.

Consistent with early studies that involved measures of changes in morphology, studies with DNA markers have enabled researchers to group subspecies of *Apis mellifera* into three populations. As a result, we have the West European subspecies, the Asian and North Mediterranean subspecies, and the African subspecies. The first two populations of *Apis mellifera*, the population comprising the West European subspecies and the population of Asian and North Mediterranean subspecies, are more related to the population of African subspecies of honey bees than they are to one another. This relationship suggests that the movement out of Africa took place in at least two distinct waves. Genetic analyses further suggest that the honey bee is more closely related to us than to one of its insect relatives, the fruit fly.