# Annually Social Bee Lifecycle

A small percentage – less than 10% - of North America's native bee species exhibit some degree of annually social nesting behavior. These bees nest in seasonal colonies consisting of two or more adult females that co-operate at some level to construct, provision, and often defend the nest. Unlike the permanent colonies of honey bees, these social arrangements don't endure beyond a single nesting season.

The strategy of nesting socially has arisen independently numerous times among bees, suggesting that under certain circumstances co-operation among females offers some reproductive advantage to the species. In North America, annually social species are primarily represented by two groups of bees – sweat bees (subfamily Halictinae) and bumble bees (genus *Bombus*). What most of these socially nesting bee species have in common is that they produce multiple generations of offspring per year. Although some of the individual females in these annual societies won't mate or reproduce, the colony as a whole can develop rapidly, ultimately benefiting the specie's overall reproductive success.

**Social Sweat Bee Lifecycle**

More than 200 species of North America's sweat bees are known to nest socially, though the degree and nature of their nest affiliations vary considerably. Sweat bees in general, even the strictly solitary species, share several life cycle features which likely predisposed these bees to develop social nesting strategies. They typically have multiple generations of offspring per year; the first generation produced is frequently all or mostly all female; and the mated females of the last generation hibernate through the winter to found new nests in the spring. These life cycle features, shared by most sweat bees, are integral to the more socially advanced nest organizations found in North American native bee species. It's really not too surprising then that a number of sweat bee species can exhibit solitary nesting behavior in some circumstances, and social nesting in others.

*Many species of sweat bees, such as those belonging to the genus, Lasioglossum, have annually social colonies. Lasioglossum sysimbrii. Photo by Rollin Coville.*

The social nesting arrangements of sweat bees run the gamut between the simple sharing of a nest entrance, to a more or less structured caste system of egg-layers, house bees and foragers. The most basic level of sociality, known as "communal nesting", involves two or more females that agree to share a common nest entrance. In this scenario all further co-operation among the nesting females is left at the door, so to speak. Each female goes on to excavate and provision her own brood cells, as would any solitary sweat bee.

At the more sophisticated end of the social spectrum, sweat bees form colonies similar to those of bumble bees, and are said to be "eusocial". Eusocial colonies are characterized by a founding female egg-layer and one or more generations of mostly non-reproductive female offspring that serve as workers. A mated female sweat bee emerging in spring will excavate her tunnel nest, construct and provision her brood cells and lay her eggs. At this stage she is operating in the same manner as a solitary sweat bee. When the first offspring emerge as adults, most of the daughters remain in the natal nest to work as

foragers or house bees. In fact in many species of sweat bees the founding female ensures that her first round of offspring will consist almost entirely of females. With no males about to otherwise entice them, these daughters may be more inclined to stay at home and help raise additional offspring – talk about calculating mothers!

Over the course of her reign, the founding female, or "queen", does almost no foraging, directs the activities of her female workers and inhibits their reproductive development. Even so, the division of labor within the female ranks of social sweat bee colonies can be somewhat vague. Especially among the later rounds of offspring there is often a rather fluid exchange of house bee, forager, and even new egg-layer job titles. At the end of the season, males and reproductive females are produced. The young females mate, hibernate for the winter, and emerge the following spring to found new nests and complete the cycle.

**Bumble Bee Lifecycle**

Bumble bees, including the four dozen or so North American species, also form annually eusocial colonies, with a single egg-laying queen and several generations of female offspring that become her workers. While their nest cycle is in many respects similar to that of social sweat bees, the organization of bumble bee colonies is rather more refined and stable than the often hazy caste systems of their subterranean cousins.

As with sweat bees, the cycle begins with a mated female emerging in the spring from her winter hibernation. Before founding her nest, the new bumble bee queen must forage for both pollen and nectar to build up her reserves of energy for the significant task ahead. Once she locates a suitable nest site – usually in an abandoned rodent nest or under a grass tussock – she begins the business of gathering pollen and nectar to create a food store for her first offspring.

*Newly emerged bumble bee queen foraging on spring blooming Ribes to provision her nest for her first round of offspring. Photo by Mace Vaughan, The Xerces Society.*

By secreting wax from glands in her abdomen, the new queen creates a small wax pot in which to store nectar for herself. She creates a loaf of bee bread (pollen moistened with nectar), and lays her first dozen or so eggs around the edges of the loaf. She creates a depression in the center of the loaf where she will sit to incubate her brood and encourage their development. By shivering, a bumble bee can increase her body temperature, a device the queen uses when she is brooding. The queen secretes more wax to create a cover for the pollen loaf and its batch of eggs. She spends most of her time sitting on top of this wax cell incubating her brood, but in order to maintain her body temperature must leave periodically to forage for nectar for herself. It is estimated that a brooding queen may need to visit as many as 5000 flowers a day to maintain the body heat needed to brood her eggs! From this it's clear how important it is for gardeners to include an abundance of spring-blooming plants preferred by these early royal visitors.

As her first brood develops, the queen surrounds each larva with its own wax cell. Before these offspring emerge from their cells, she will lay another batch of eggs. All of the eggs the queen has laid so far are fertilized, so they will develop into females. Only unfertilized eggs develop into males. When the first female offspring emerge from their cells, they will take over the nest and some foraging duties, releasing the queen to focus on laying eggs. The second round of female offspring are generally larger than the first, as they are better fed by the workers, and so are often more fit to assume most of the demanding foraging tasks.

*This queen bumble bee (Bombus impatiens) has been brooding her first round of offspring, which have just emerged from their wax cells; these newly emerged female workers will now take over foraging and nest duties, releasing the queen to focus on egg-laying. Photo by Elaine Evans.*

Although they cannot mate due to an absence of males, the female workers will occasionally lay unfertilized eggs (which would develop into males). At this early stage in the development of the colony, however, these male eggs are usually eaten by the queen. As the colony develops, the nest workers attend to the brood cells, feeding them progressively. As workers either remove the wax from an old brood cell to use in constructing new ones, or simply repurpose the cell for pollen or nectar storage, the cavity nest is soon filled with a jumbled array of various-sized wax pots. As the season progresses the colony grows in size, with new female workers emerging before many of the older ones die. Colony sizes vary with species and climate, but at their height typically have a few dozen to a few hundred individuals.

*Male bumble bees and new queens are produced towards the end of the season, just before the annual colony dissolves. Male bumble bee (Bombus flavifrons) drinking nectar. Photo by Rollin Coville.*

Invariably, as the number of females in the colony increases, more of these unmated workers will lay male eggs. At this late stage in the season the queen doesn't manage to destroy all of these eggs, and they will go on to develop into adult males. A number of the late season males produced by a bumble bee colony are the result of these undetected worker eggs. At about the same time, the queen will begin to lay male eggs and also female eggs destined to become the new queens. No more worker females will be produced by the colony at this point. The prospective queen larvae are given more food, spend more time developing as larvae and emerge as larger adults than did the female workers.

Upon emerging, the adult males leave the nest permanently to find mates. The young queens, emerging about a week later, leave the nest periodically to forage for themselves and to mate. By fall the males and the rest of the colony, including the old queen, will die. The newly mated queens will forage extensively to build up their reserves, and then find a suitable spot to hibernate over winter. They typically burrow a few inches underground or under a pile of leaf litter. The new queens will emerge from hibernation the following spring to found their own nests and begin a new cycle.

**That was exhausting! How can we help these tireless heroines?**

Given the tireless and varied nesting industry among North America's thousands of species of native bees, it's easy to appreciate the need for providing these essential creatures with a continuous supply of food and places to nest. To support the demanding nest construction and provisioning tasks of our female native bees, we need to make ample forage and nest sites available to them from spring through fall. Creating your own wild bee garden will help conserve our premiere pollinators.

*Photo by Matthew Shepherd, The Xerces Society.*