

SURVIVAL TRAITS OF THE EUROPEAN HONEY BEE

European honey bees are generally forest creatures. Here's why!

Walt Wright

Every action and reaction of the honey bee colony is based on survival instincts. The species has had eons to perfect their survival instincts. Those instincts even govern lack of activity in some circumstances. Every aspect of the colony activities are oriented toward survival. That concept may sound like over statement to the beekeeper who has not considered the subject at all, but this series will attempt to substantiate that position.

Honey bees are wild creatures that man has elected to use for his own purposes. To effectively harness the energies of this wild creature, we need to be familiar with the survival characteristics that motivate them. The more you know about the survival traits of this species, the better beekeeper you will be. Instead of fighting the natural instincts of colonies in your care, you can work within their normal operations. You will find that working "with" the bees is less time consuming and improves your bottom line.

The reference literature, for reasons unknown, has very little definition of survival traits. Most management recommendations of the popular literature are oriented to imposing your will on the wild creatures. Its also recognized in that same literature that the approach produces limited success. Some colonies will succeed in fulfilling their survival instincts in spite of your best efforts to undermine their progress.

This series will start so basic

as to be boring to the reader. We feel we need to build from the ground up. The content of the first segments provide the background to be applied to detailed information coming later. The detailed information in later segments has met considerable resistance from "experts" and experienced beekeepers. Perhaps the proper foundation will help

Those that can safely swarm, in any given season, do just that.

Rating of colony survival above species survival can be seen readily. A weaker colony or one in poor build-up forage areas does not entertain swarm ambition. They protect their own survival as best they can. Seasonal variations in forage availability cause "swarmy" or low-swarming years. Only the colony that can afford it, in any given year, produces a reproductive swarm. They do not jeopardize survival of the existing colony to reproduce.

Its not generally recognized in the popular literature that the honey bee is a forest creature. Their survival format was developed for life in the primordial forest of Europe. Home was a hollow tree, and tailoring of their survival format for that circumstance can be seen in almost all of the seasonal activities of the colony. They can survive and reproduce in a forested area where there is a solid canopy of treetops within their



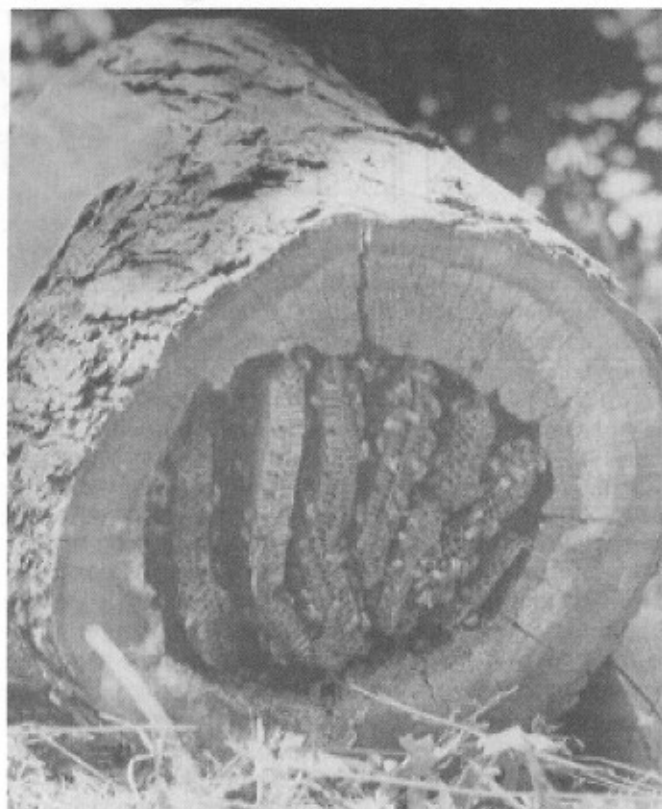
The hives we use today may be more tree-like than we think.

support the more controversial concepts.

The activities of the colony are tailored to two main levels of survival objectives. Short-term survival is top priority and involves survival of the existing colony. Perpetuation of the species by reproductive swarming is a long-term survival requirement that is a lower-level priority. However, reproductive swarming runs a close second priority.

flight range. Agricultural sources, such as clovers, are not needed in their survival strategy, but the colony takes advantage of the nectar bonanza and stores more than they need when provided extra space. When space is restricted in the tree hollow, they could ignore clovers. Survival requirements are typically satisfied prior to agricultural source appearance, but they might use some of the bonanza to

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Bees design their own destiny.

maintain stores on hand.

The bees and trees derive mutual benefit from the relationship. The majority of trees bloom in the period of Spring leaf-out. Others lead and lag that period somewhat. Leaf-out is the period that the honey bee has built strength for division by the reproductive swarm. From the tree's perspective, the honey bee has peak strength when they need pollination most. From the bees' perspective, the trees provide forage sources when the off-spring swarm needs them for establishment in a new location.

The honey bee's survival format is tailored to life in a hollow tree that is located in unbroken miles of forest. All tree hollows are not the same size. Their format is flexible enough to be applied to cavities of different volumes. Once the cavity is filled with functional comb, they must regulate stores and population to conform to that fixed volume. Other species, such as wasps or bumblebees, have no limit on colony strength. They get as strong as conditions will support each season. Their seasonal objective is to rear as many mated queens in the Fall as possible. Those mated queens will hibernate over the Win-

ter and start from scratch in the Spring.

The wasp/bumble bee season objective can be broken down into several phases. Initially, the overwintered queen does all the work herself. She gathers nest material, building the beginning nest, and gathers feed for the first group of helpers that she rears single-handedly. With emergence of the first group of workers, the queen can retire from field work (risky business). The workers will continue to build colony strength in population and

nest size. At some point in late Summer, the emphasis shifts to rearing queens for next Spring and the drones for Fall mating.

The simplistic lifestyle of those species have at least three seasonal periods when colony activities are different. All three periods reflect a change in activities that are oriented to colony survival and reproduction. We are inclined to call those activities "internal operations." Internal operations, or differences in population objectives and activities, are much more complex for the social insect lifestyle of the honey bee.

In contrast, the honey bee must regulate strength to a fixed volume, reproduce by population division, and Winter as a colony. The internal operations of the honey bee colony change more often as a result of their more complicated survival format. We will treat those changes in a separate article. But before we get to a description of changes in internal operations of the honey bee colony, we need to discuss special skills to accomplish the survival format they have chosen. The reference literature provides very little insight on those special skills.

START OF SPECIAL SKILLS (#3)

The honey bee's adaptation to inhabiting tree hollows has endowed them with many special skills. If a wasp or a squirrel chooses the tree hollow for a nest site, it imposes no special problems for either. The social insect lifestyle of the honey bee, however, is tailored to use *all* of the cavity available space. The swarm moving into a cavity will clean up punky wood or debris left by former residents down to the live wood. Concurrently with clean up, they will start comb construction at the top. Comb construction is top priority for the swarm in a new location. They must have comb for stores and brood to become established. The establishment goal is to fill the whole cavity with functional comb. A large cavity may take longer to fill than the first season.

The description of establishment above is included to make the point that the new (first year) colony is not fully established until their quarters are furnished with functional comb. The special skills described below are pertinent to the established colony. When the cavity is filled with functional comb, limits are set for colony strength.

The colony must regulate population in balance with food supplies. Its easy to understand that balance is a firm requirement. Serious out-of-balance conditions are a formula for colony disaster. The colony must maintain adequate food stores reserve for periods when forage sources are not available. The need for adequate reserve is particularly acute in the Fall when the colony must feed itself over the Winter. Not only must adult bees be fed, but they are going to start brood rearing in the dead of Winter. But, of course, that is not news.

What you may not have considered is that regulation of population in balance with stores and overall space is an on-going, *everyday* effort. Cell use in the fixed cavity is apportioned to brood or stores on a proportional basis. Brood volume controls population, and is adjusted up or down to accomplish season objectives. In the Spring build up, brood volume is increased to support division by the reproductive swarm. During the main flow, brood volume is reduced to a level that just generates replacement

bees. In the early Fall, if there is an increase in forage, brood volume is increased to generate young bees for wintering. In late Fall, the brood nest is shut down completely to conserve resources in early Winter. Through all these seasonal variations, the population is maintained in proportion to stores and overall cavity space. The special skill of the honey bee in making this come out right is awesome. For those of you who have a difference of opinion about the swarming season, be patient. We'll get to that in due time.

Another colony skill is conservation of stores. On the main flow, Winter rations are stored. Their heritage as forest creatures dictates storage of supplies while field forage is available. In the extended forest, Fall forage is minimal - not many trees bloom in the Fall. This can be seen by the extra pollen stored for Winter on the main flow. The current feed pollen will be dry and bright colored. Winter pollen will be glazed with honey to preserve it until needed.

After storing Winter rations on the main flow, the colony becomes very miserly on consumption of those stores. Most of the adult bees are quiescent during any period of low field forage. Inactive bees use less food. Minor forage sources are exploited to the extent that Winter stores are supplemented, and active brood rearing is using some of the stores. But they do not send the whole forager force for maintaining Winter rations.

However, when field forage is showing a sustained increase that simulates the Spring season, some colonies will entertain swarm ambition. It is not obvious to the colony that the Fall flow will end abruptly with freezing weather, and

an offspring swarm doesn't have a prayer of establishment. But, as mentioned earlier, a strong Fall flow would be uncommon in the established forest.

The Fall brood nest closeout serves several purposes, and one of those advantages is conservation of stores. By stopping brood rearing while forage is still available, those cells can be filled with nectar. In this way, the whole cavity is filled with stores in early Winter. Elimination of the need to maintain brood nest temperatures is the conservation advantage. Not only is less honey consumed as thermal fuel, but the cooler cluster temperature causes some bees to go into a state near suspended animation. Like other wintering insects, they use very little food in that state. In my area, the first Winter brood volume is often quite small. Consumption of feed in the center of the cluster makes empty cells for the first brood cycle in mid-Winter. When the first brood volume is only softball sized, it shows how little was consumed in two months by a cluster starting with more than a deep super full of bees.

Another special skill is synchronizing the colony activities to the vegetative growing season. They are quite proficient at doing the right things at the right time to insure both colony survival and reproduction. Without going into great detail, we can offer a couple of examples. About midway of the build up, without a hint of green anywhere, the colony starts rearing large numbers of drones. To get mature drones on the wing takes longer than queens, so they start earlier. In anticipation of the mating season, drone rearing leads the swarm preparation season by about

a month.

The target reproductive swarm issue period was discussed in an earlier article. The peak forage availability in the forest is green-up or leaf-out in the Spring. They want the offspring swarm to have the advantage of that peak forage availability. Perhaps I give them *too much* credit, but it seems to me that the colony has the ability to speed up or slow development to hit that window of opportunity. In late Winter, the well-provisioned colony forages primarily for pollen and water. They need to consume honey to add space for brood volume. Later, they approach the swarm preparation season, and maximum safe brood nest expansion, the colony is feeding on incoming nectar only. It seems to me (and I can't defend this with supporting data) that the colony has the ability to adjust percentages of honey or nectar consumption to arrive at the swarm preparation season with the right brood/stores ratio. What I *have* seen is that some colonies consume large amounts of capped honey, and some consume almost none in the week ahead of the swarm preparation season. Although most of the information in this series is based on solid observation, this entry is more in the realm of the "gut feel."

Most of the special skills discussed above imply yet another special skill. Controlling the activities of the colony in consonance with the growing season and their fixed volume implies some judgment on the part of the colony. We will treat judgment and decision making as separate entities. **BC**

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