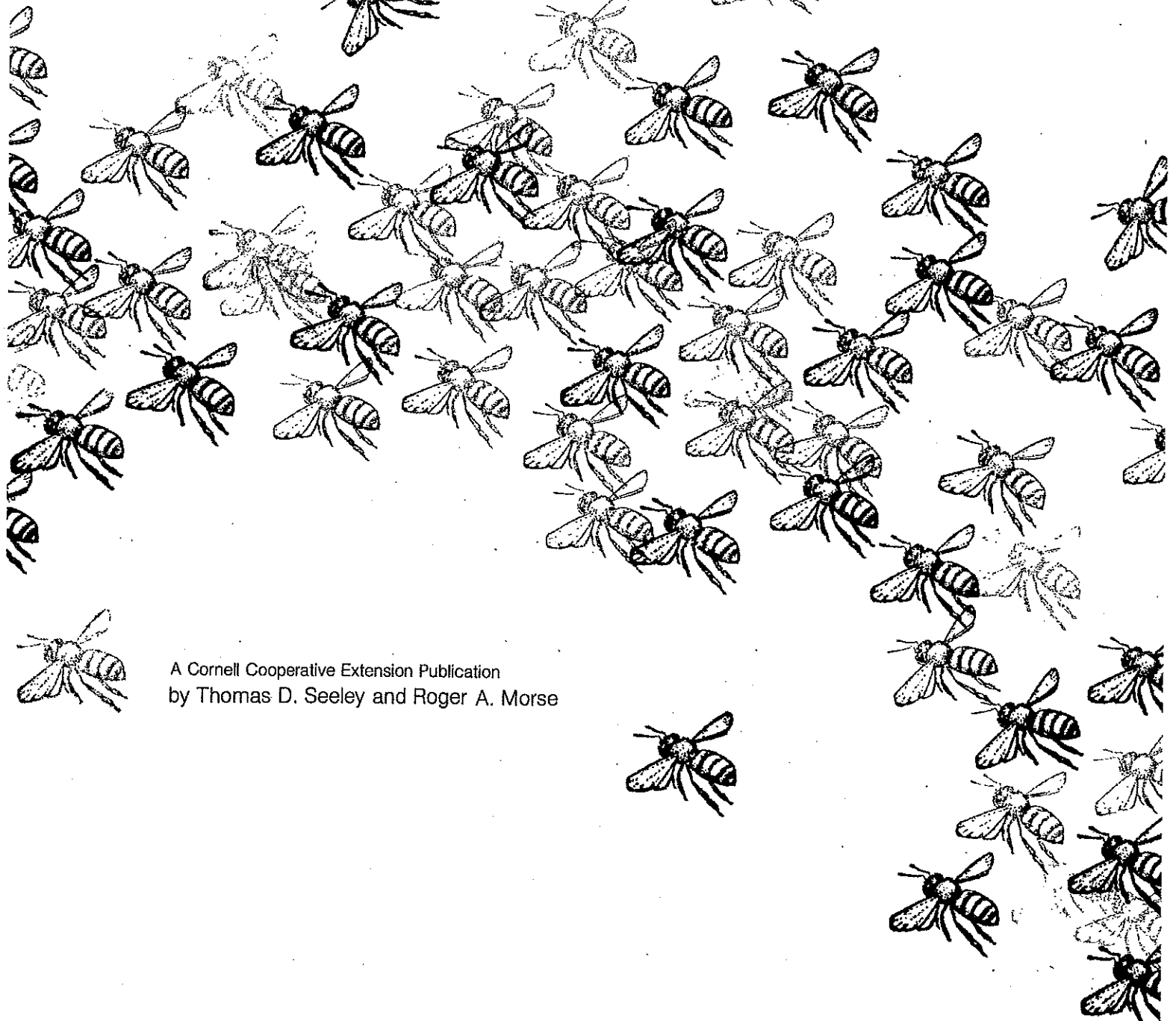




# Bait Hives

For Honey Bees



A Cornell Cooperative Extension Publication  
by Thomas D. Seeley and Roger A. Morse



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## Introduction

In many parts of the country there are many colonies of bees in hollow trees and buildings. These bees have escaped from beekeepers' hives and have reverted to natural nests like those of their ancestors. When bees select a nest they prefer cavities smaller than the hives that are used for bee husbandry. The small nests encourage swarming (colony division). These swarms, plus those that normally escape from beekeepers' hives, may be harvested by placing bait hives in suitable locations.

In good years in the Ithaca area in central New York State we have had 80 percent of our bait hives filled, sometimes capturing nearly a hundred swarms. In our poorest year only 20 percent of the hives were occupied.

Newly captured swarms, like package bees, rarely produce a surplus for their owner the first year. In fact, if a swarm is captured late in the season it may need some feeding to survive the winter. Capturing swarms can be an easy, inexpensive way to begin in beekeeping.

Observing the way in which a swarm selects and builds a new nest can provide a new beekeeper with important background information necessary for successful pursuit of the art.

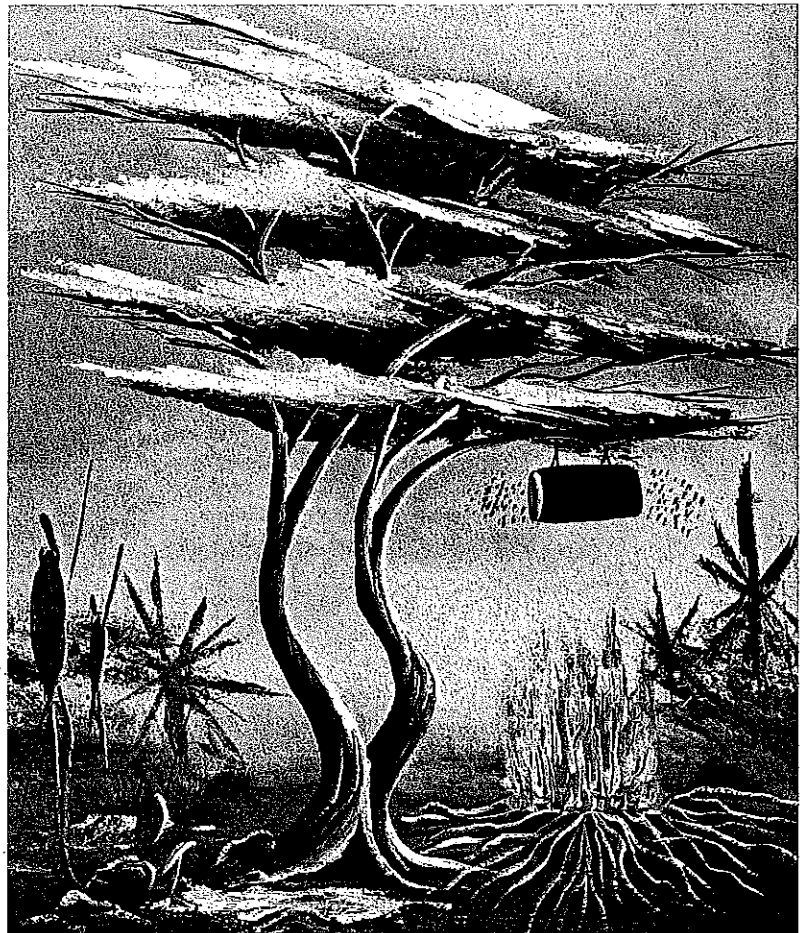
## What Is a Swarm?

When a colony of honey bees becomes strong in numbers it divides into two units, the parent colony and the swarm. The swarm is made up of 30 to 70 percent of the bees in the parent colony. The number is never the same and changes if the swarm is put back into the parent hive, thus forcing it to swarm again the same or the next day. The swarm is predominantly worker bees, some drones, and usually the old queen. A young, usually virgin queen accompanies the swarm only if the old queen is lost or cannot fly.

In our experimental work we found that the number of bees in a swarm varies greatly. The minimum number is about 2,000 and the maximum over 50,000; however, average swarms have 10,000 to 12,000 bees, about the number in a three-pound package of bees.

This painting by an unknown artist was purchased in the Nairobi (Kenya) market. Great numbers of people have devoted themselves to beekeeping in East Africa for several thousand years. To produce honey and beeswax they place their homemade hives where they will attract swarms that will make a crop for harvest several months or a year later. This painting is biologically correct. This hive is the right size, elevated, shaded but visible. Our research confirms what these people have known for centuries and learned through trial and error. The tree shows the effects of the wind on the Nairobi plain. The warriors are Masai with their typical red dress and spears.

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A swarm or package of bees weighing three pounds is considered a good starting unit. Commercial beekeepers sometimes start colonies with only two pounds of bees, however, such units need special feeding and protection to survive. The size of the swarm is in proportion with the size of the parent colony. Bees cast swarms when their residence becomes crowded or congested. Colonies in small hives swarm more frequently than those in large hives, and the number of bees in the swarm varies the same way. Some of the very large swarms we have encountered probably resulted from two or more swarms becoming confused and joining. Some prosperous colonies may cast second and third swarms.

Bees in a swarm are of all ages, some young and some old. Thus, even the day it is hived there is a normal, natural death rate. Insofar as the beekeeper is concerned, it is important that the queen begin to lay eggs and make replacement bees as soon as possible. Twenty-one days are required to grow a worker bee from egg to adult. The time a bee lives is controlled by the amount of work she does. Worker bees may live only five or six weeks. Thus we see that a swarm is a frail unit with a limited life span. Our data show that 80 percent of swarms in nature fail to survive the first winter. Even the best beekeepers lose some colonies throughout the year, winter losses being the greatest problem. Good beekeeping involves reducing these losses to an acceptable level.

### When Does Swarming Occur?

In central New York State, and we presume similar latitudes in the northern United States, 80 percent of swarming takes place between May 15 and July 15. Nearly 20 percent takes place between August 15 and September 15, with one or two percent occurring in the intervening month (Figure 1). As one moves south, swarming starts earlier: about April in Maryland and in late February and March in Florida. Successful use and especially harvesting of bait hives requires knowing when swarming is most likely to occur in one's area. We estimate colonies in trees and buildings cast swarms nine years out of ten, while those kept in fabricated hives may do so less frequently.

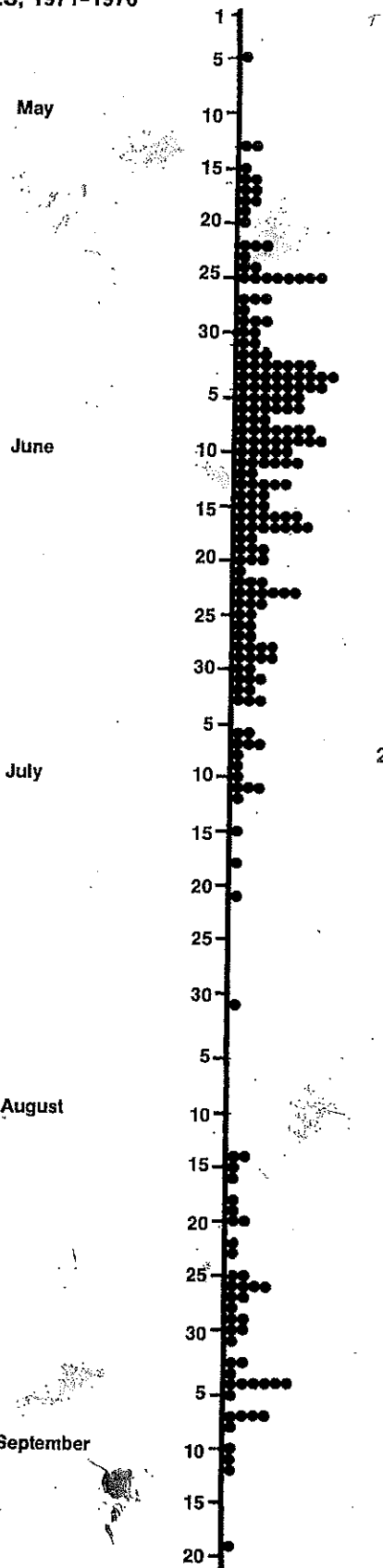
Figure 1 shows three swarms that emerged before May 15; two, at a low elevation on the hill west of Ithaca, were cast by the same bee tree but in different years. We believe that the issuance of these three swarms indicates clearly the importance of microclimate in bee biology. Colonies located under favorable locations are more likely to grow and prosper rapidly than are bees in poor locations. Ithaca's elevation is about 400 feet, but the bulk of our data comes from swarms on the hills around Ithaca, which range above 700 feet in elevation. These data are important to the beekeeper when selecting sites for apiaries.

Colonies about to swarm send scout bees to the field to search for new homesites several days before the swarm issues. Finding a suitable homesite is critical for swarm success. Home-seeking bees can be seen flying up and down tree trunks investigating knotholes. Thus, while we can state that the first swarming occurs about May 15 in our area, the search for homesites may begin as much as a week earlier, a fact the user of bait hives should keep in mind.

While the departure of a swarm from its parent colony may take only five to ten minutes, as many as ten days are involved in preparing the colony to swarm. Included in this preparation is the development of the four pair of wax glands on the underside of the worker's abdomen. Thus a swarm is prepared to build rapidly a large quantity of new comb. This is a consideration in the proper use of a bait hive. The beekeeper may take advantage of this feature of a swarm's biology and use a new swarm to draw good combs from foundation. This also means that bait hives harvested only intermittently may contain a great quantity of fragile, new comb. This may make the transport of full bait boxes difficult, as overheating may cause the comb to melt, or undue jarring may break comb and kill bees.

Figure 1. The dates show when swarms emerged in the Ithaca area from 1971 to 1976. These data indicate bait hives should be in place by May 1 to be effective and to attract scouts.

### SWARM EMERGENCE DATES, 1971-1976



It has already been indicated that the size (volume) of the parent hive affects how soon a colony becomes congested and swarms; however, other factors are important, also. Before a colony becomes congested it must grow. Growth is controlled by the availability of food, the ease with which the colony can control its hive environment (colonies with damp bottom boards may have more difficulty controlling the brood rearing temperature), the age of the queen (young queens lay more eggs than old queens), and disease. We have no precise information on the number of colonies that live in hollow trees and buildings, and this certainly varies among different areas, but we do know it may approach or even exceed the number in fabricated hives in some areas.

### House Hunting by Bees

Scout bees comprise a small percentage of the older field bees in a hive. The percentage appears to vary from time to time, but a figure of about five percent appears to be normal. In normal day-to-day living the scouts' chief concern is finding food and recruiting others to collect it. They then may seek still further afield for even better sources.

When a colony becomes congested, scouts have difficulty inducing the younger house bees to take the nectar they have collected. We believe that this in turn discourages scouts' food foraging and, if it persists, their attention turns to selecting a new homesite for the swarm.

During the past few years we have offered bees specially built bait hives (usually in the shape of cubes) in pairs, each hive different from the other only in one respect. In this way we have learned that honey bees can measure certain qualities and make choices.

When given a choice, bees in a swarm show a decided preference for the following:

1. *Height:* about 15 feet above the ground.
2. *Shade-Visibility:* well shaded, but highly visible.
3. *Distance from parent nest:* not important.
4. *Entrance size:* about 1¼-inch in diameter.
5. *Entrance shape:* not important.
6. *Entrance position:* near the floor of the hive.
7. *Entrance direction:* facing south, but not absolutely required.
8. *Cavity volume:* 40 liters or about 1.4 cubic feet. This is almost equivalent to the volume of a ten-frame super (*Figure 2*).
9. *Cavity shape:* not important.
10. *Dryness and draftiness:* dry and snug, especially the top.
11. *Color:* no data, but we preferred dark colors to reduce vandalism.
12. *Type of wood:* many types of trees have been occupied, but new wood may be avoided by bees.

We believe these are the chief parameters important to nest site selection by honey bees. Several minor components remain to be researched. All our boxes were made with 5/8-inch-thick plywood; we have not tested nest boxes made with lighter or heavier wood. We have not made a thorough investigation of hive odor. We are aware that adding punk and

decaying wood, as would be found in a hollow tree, does not deter bees. The addition of a small piece of comb in the bottom of the box had no influence in our tests, but is mentioned so often by those who advocate the use of bait hives that it almost appears sacrilegious to omit it.

### Building a Bait Hive

A bait hive attracts scout bees and a swarm only if it is properly built. The important considerations are listed above. We emphasize the importance of dryness and snugness. Light must not enter from the upper portion of the nest through cracks. Water, too, must be excluded.

The box should be built so that the top or the bottom (it doesn't really matter which) may be removed easily to examine the nest and evacuate the bees. Only a few short nails are necessary to hold a top or bottom in place if they are properly used. Also, the box needs to be equipped with a projecting piece of wood or some type of hanger so that it may be removed easily from its temporary location. It is a great frustration to find that a box has fallen to the ground because of poor nailing or to have difficulty removing a box from a tree because it was nailed in place too securely. A nail across the entrance hole is necessary to prevent birds from occupying bait hives.

The measurements for the cubes we used in our research are shown in *Figure 3*; however, our data indicate the shape of the hive is not important. An eight- or ten-frame super may be used for a bait

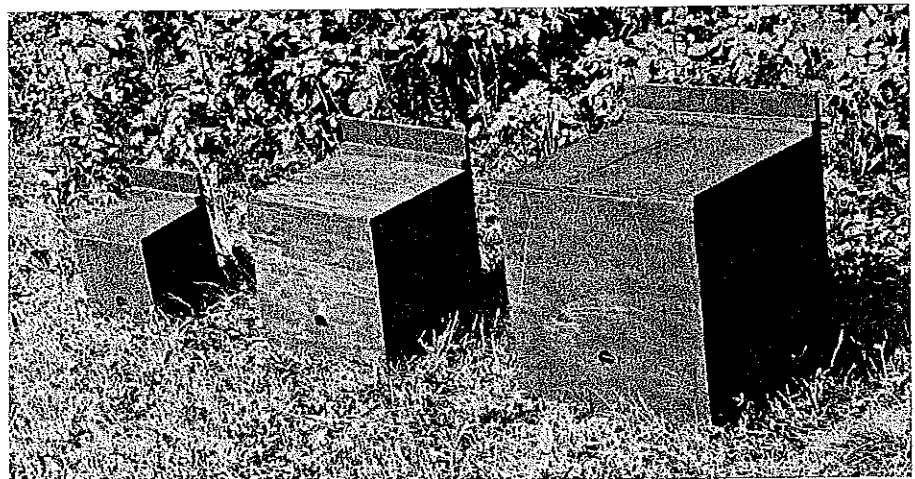


Figure 2. In our experimental work bait hives of varying sizes were used. These boxes had volumes of 10, 40, and 100 liters. When swarms were given a choice of these three boxes spaced a few meters apart, they usually selected the box in the middle which is described in figure 3. If the middle size box was occupied a second swarm might accept the large box but never the smaller one. The size of the swarm had no effect on the size box selected.

box. We do not advise using lightweight wood, and we do not put frames, with or without comb, or foundation in our bait hives. Comb attracts wax moths, which discourage bees from entering; foundation warps after a day or two of varying temperatures and cannot be used. We know of no way to guide the bees in which way they will build comb. Our experience indicates that an empty box is the best bait hive.

### Positioning Bait Hives

Success in using bait hives depends upon proper site selection. We have observed swarms move into bait hives only to reject them an hour or a day later. Scouts can make errors! Once bees have built combs and have brood, they will rarely abandon a new home.

A good location for a bait hive is about 15 feet above the ground, highly visible (to maximize likelihood of discovery by scouts) and fully shaded. For maximum success, all three criteria must be satisfied. *Figure 4* shows several well located hives. The picture on page 1, by an unknown artist, illustrates an ideal site in Kenya. Kenyan beekeepers have known for hundreds, perhaps thousands, of years what we learned only recently.

### Inspecting Bait Hives

Our experience with leaving bait hives in place to overwinter is not good; very few colonies survive. We have no data, but are of the opinion that bait hives are not as protected as tree cavities and that the

winter death rate of colonies left in bait hives is much higher than the normal 15 to 20 percent loss of established colonies in tree holes, though perhaps not significantly higher than the 80 percent mortality of colonies in trees during their first year.

We found it advisable to check our bait hives frequently, first to obtain data about the time when they were occupied and second to recover the bees. We also found that it is much easier to take down and recover bees in a recently occupied bait hive than it is to leave it in place and allow the bees to fill it with honey.

When we observe activity at the entrance of a bait hive it often takes several minutes to confirm if the bait hive is occupied or if it is merely being investigated by scout bees. The problem becomes more difficult if there are few bees in the swarm. A swarm with only 2,000 to 5,000 bees shows markedly little activity at a colony entrance.

The surest sign that a bait hive is occupied is the sight of incoming, pollen-laden bees; home-seeking scouts do not carry pollen. Not all bees collect pollen, however, and at certain times of the year in certain localities there may be a dearth of pollen. In general, foraging bees appear at the entrance of an active hive, take wing, and may be seen flying away. Bees scouting a bait hive move in and out of the entrance, sometimes taking short flights, but they return again and again to the hive.

### Taking Down a Bait Hive

An occupied bait hive may weigh as much as 60 to 80 pounds. It is not an easy object to detach and carry down a ladder. A heavy bait hive may be found early in the season, sometimes as early as mid-July, when there has been a good honey flow from trees such as basswood. It is not uncommon for bees in even small hives to harvest several pounds of honey in a single day, making it possible for a hive to gain weight rapidly. Even hives without large stores of honey may contain many pounds of bees and brood.

Bees in a bait hive are no different from those in a normal hive. They have guards that protect their nest with care. Under normal circumstances, a beekeeper approaching a hive smokes the entrance to calm the guards. The act of placing a ladder against a tree, as well as climbing the ladder, may arouse the guards and cause them to attack. It may be possible to allow smoke to drift up over a bait hive, but this is not as effective as a few puffs of smoke directed at a hive entrance. Before placing a ladder under a bait hive the smoker should be lit and ready to work. Climb the ladder with care to keep vibrations at a minimum and quickly smoke the entrance of the bait hive.

It is important to tie a filled bait hive into place carefully with rope before removing the nails that hold it to a tree or other object. Use one end of the rope to secure the hive and place the other end around a limb above the hive and tie it to the ladder. Remove the nails; then untie the end of the rope attached to the ladder and allow the hive to slide gently down one of the side rails of the ladder; or let the hive hang free of the ladder and slowly lower the hive to the ground.

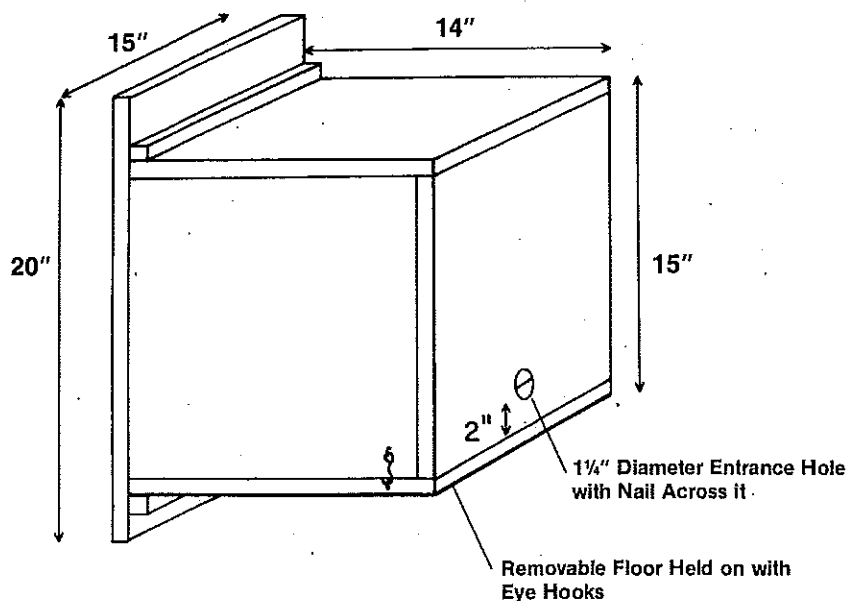


Figure 3. Our experimental work on bait hives was done using 15-inch cubes made of  $\frac{1}{2}$ -inch plywood. The shape of the bait hive is not important but the volume is a major consideration. Our data suggest a sturdy box the size of a standard 10-frame Langstroth super would be satisfactory.

Remember that in a bait hive there are no wires or woodenware to hold the comb in place. New comb is weak; old comb is strengthened by the addition of cocoons and propolis. If comb is broken as a bait hive is lowered to the ground, there is danger of killing bees and losing honey. Honey dripping from a bait hive causes a mess and in time of a dearth of food, may cause robbing. To avoid breaking comb, the bait hive should be kept in the same position, with the top up, as it was in the tree.

### Screening Bait Hives for Movement

It is possible to screen the entrance of a bait hive before removing the hive to a new location. It must be understood, however, that screening a hive entails some danger. Bait hive entrances are small and ventilation is limited. If the hive is filled with bees, brood, and food, the excited bees may generate too much heat, which causes comb to break away and the bees to suffocate. This is a danger that commercial beekeepers face when they move their colonies, and rarely do they screen individual colonies of bees. It is much more satisfactory, they believe, to use refrigerated trucks, to screen the whole load, or to move the colonies with their entrances open. Under these circumstances, if overheating occurs, the bees may cluster near the outside of the entrance and by escaping from the hive, prevent it from overheating.

When the weather is cool or rainy a colony entrance may be smoked slowly, even when many bees are hanging on the outside. The bees will crawl to the inside of the hive. At this time it is possible to nail or tape wire screening over the hive entrance. The screening should be removed as soon as possible after the bees are in their new location. Under no circumstances should a hive remain screened all day, especially if it is exposed to the sun. Eight-mesh hardware cloth is a good material to use to screen colonies. Ordinary fly screening, which has 12 to 14 wires per inch, is also satisfactory but is not as strong.

### Transferring Bees to a Movable Frame Hive

In most states a bait hive becomes an illegal contrivance once it is occupied. It also is inefficient. Bees, once captured, should be kept only in movable frame hives.

If the swarm has built no comb, or only a few square inches, remove the top or bottom of the bait hive, whichever is removable, and dump the bees unceremoniously into or in front of a standard hive with drawn combs or frames with foundation. Unfortunately, such a home is not always acceptable to the bees. If a frame can be added with even a small amount of brood, bees rarely will abandon it. Bees are much less inclined to abandon a new home if they are hived in a light rain or in the evening. Direct sunlight, dampness, the odor of new wood and paint, and probably other factors may cause a swarm to abscond. If it does leave the hive, it usually settles nearby in a bush or tree, and you may again try to hive it in the same manner. Bees that have rejected a hive once may not do so again.

It is difficult to transfer bees from a bait hive after about the first of August in the northern states, and even this is a late date. The bees need time to rear their young for winter and to store pollen and honey for winter food. Little can be done with a bait hive late in the season except to feed it as well as possible, place it on a hive stand, provide some winter protection, and make the transfer the following spring.

There are several ways to remove bees from a bait hive in which they have built comb. A simple method is to place the bait hive on a hive stand, remove the top (or bottom, having turned the bait hive upside down), and place a super of empty combs above. The bees slowly move into the upper super as it is natural for a colony to move its brood nest in an upward direction. If there are eggs in the upper super a week or two after the super has been put into place, an excluder is placed between the two units with the hope the queen is in the upper one. If there are still eggs present after three days, she is present; if not, the excluder is removed for a few days and the process repeated. Twenty-four days after the queen is in the upper super, all of the

worker and drone brood hatch from the combs below. The bait hive then may be removed and the comb cut from it. The bait hive may be reused.

It is also possible to drum the bees from a bait hive into a new super of combs placed above the bait hive. The new super must have a cover, as bees will not drum into an open box. Drumming is a centuries-old practice used to remove bees from straw skeps and boxes. If you beat rhythmically with your hands, or a lightweight (rubber) hammer, the bees abandon the hive, even the brood, and march upward in an orderly fashion. Drummed bees do not become angry, though at the outset of drumming always smoke a colony carefully.

Still another method of transferring bees from a bait hive is to remove the cover, cut the combs from the hive one by one, and shake the bees into a super of combs. This method causes much alarm and the air may be filled with both angry and confused bees. Bees adapt to a new hive more rapidly if it contains a frame with some brood. If the queen can be found and caged in the new hive she will attract and calm the bees. This system should be used only when there are no other colonies in the vicinity, as lost bees may drift into other colonies.

When bees are transferred from bait hives with comb there is a choice of discarding the brood and comb or saving some of it by cutting and tying it into a frame. The latter is not an easy procedure, but it can be done. The easiest method is to lay several pieces of string parallel on a flat table, place a wooden frame without wires over the string, and put large pieces of comb in the frame. Then tie the string to hold the pieces of comb in the frame. Use a cotton string that can be chewed apart by the bees and that can be removed from the hive in a few days, by which time the bees will have fastened the comb in place. Be sure to place the comb in an upright position in the frame just as it was in the bait hive.

New combs made in this way rarely are satisfactory for brood rearing or honey storage. In the long run, they usually are discarded in favor of better-built wired combs, but young bees from comb saved in this manner may help to bolster the colony population. As indicated above, keeping brood in the new hive also aids in preventing absconding.

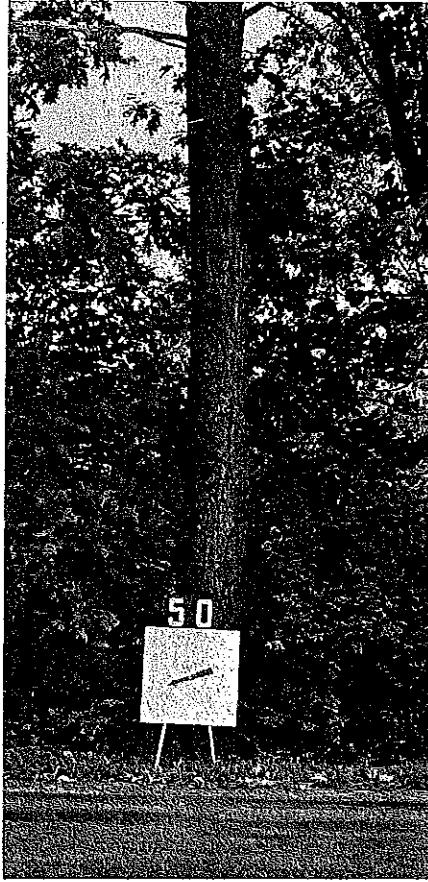
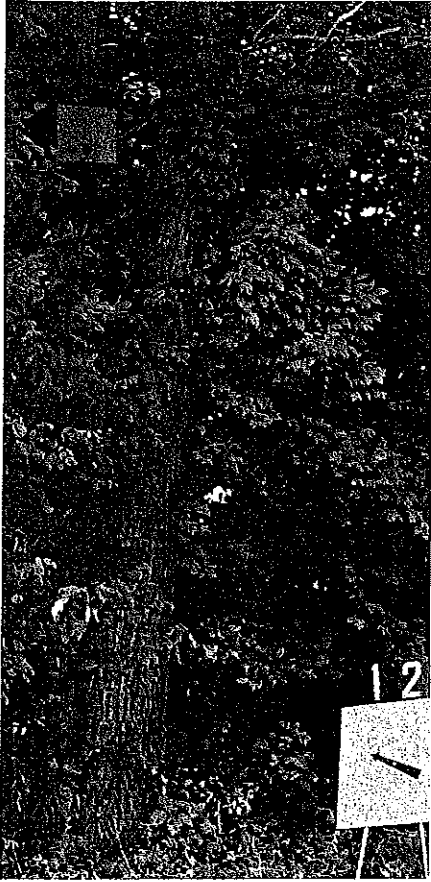
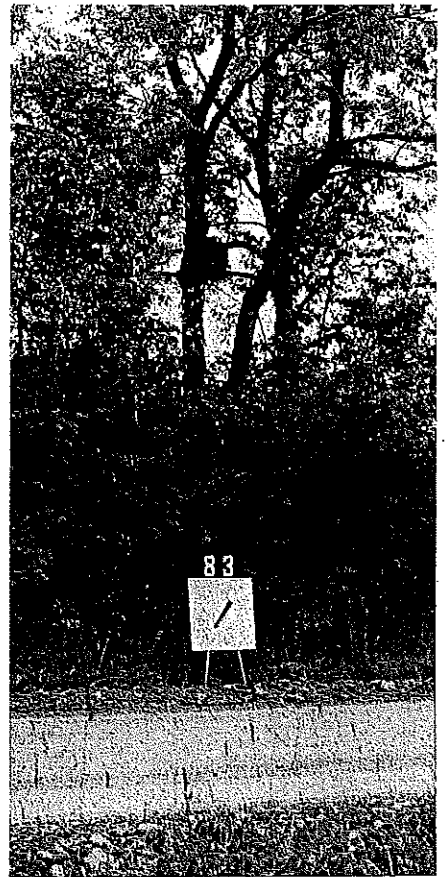
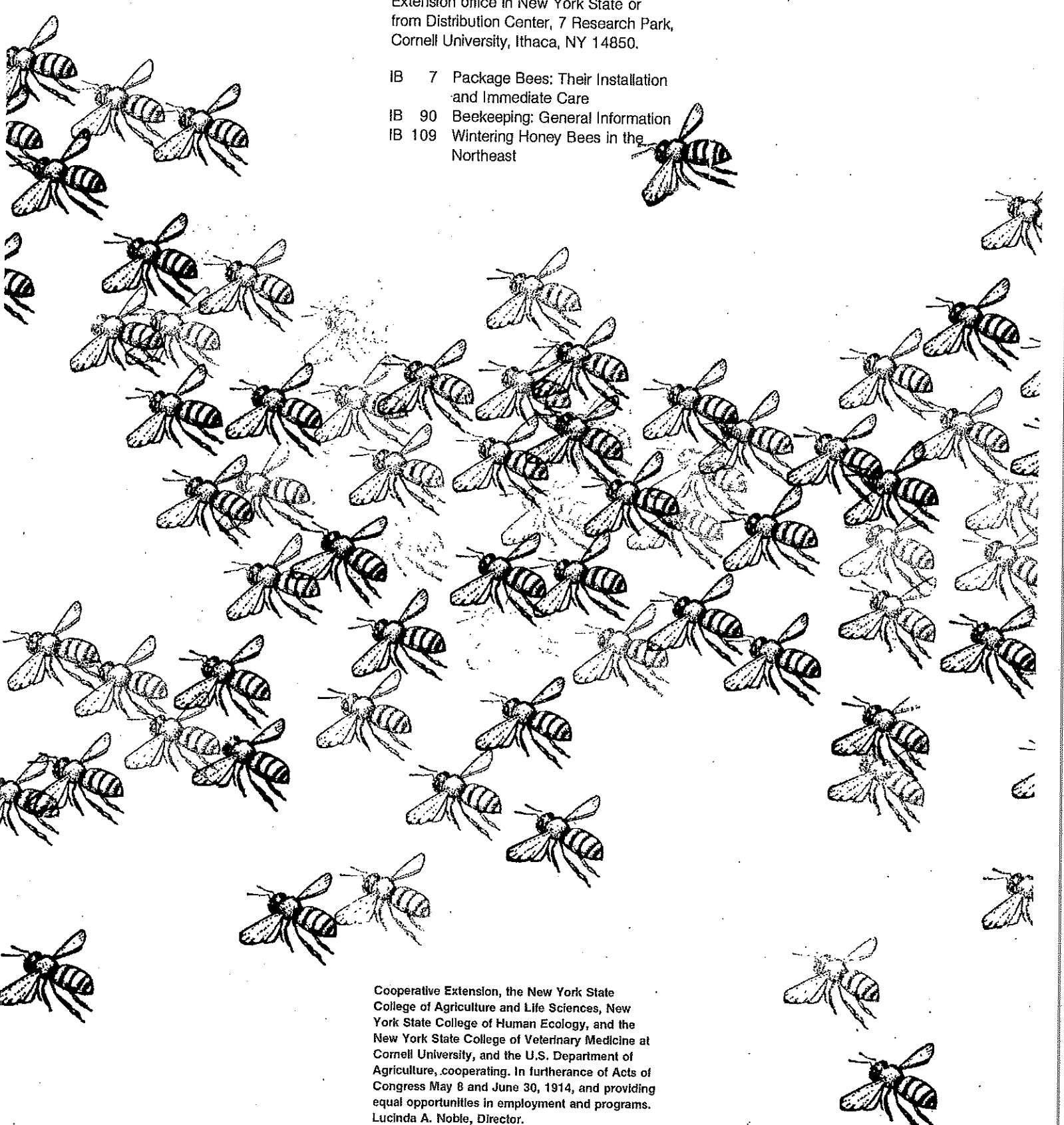


Figure 4. These bait hives were occupied by swarms and illustrate the types of location preferred by swarms. The experimental numbers are shown and the arrow indicates the nest entrance direction (straight up, indicating north).



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- IB 7 Package Bees: Their Installation and Immediate Care
- IB 90 Beekeeping: General Information
- IB 109 Wintering Honey Bees in the Northeast



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