Swarm Control

By Richard Ball, Retired National Bee Inspector, Devon BKA

Swarming is a natural instinct for honey bees, but it is the beekeepers' responsibility to help manage this within their colonies. Richard Ball explains how this can be achieved.

It is presumed in this article that the reader has an understanding of the principles of honey bee swarming. There are many factors that influence a swarming impulse in honey bees. Those usually stated are congestion in the brood nest, using a small hive and the age or fecundity of the queen. However, there are many more, such as weather, locality, management practiced, intermittent nectar flows, race or strain of bee, etc. This makes it difficult to advise other beekeepers and perhaps explains why if you ask two beekeepers for advice you get more than two different answers! With the effects of climate change these impulses are likely to fluctuate far more than in the past, so it is important to monitor and take management measures to reduce the swarming impulse. In another fifty years or so we may see a total change in UK honey bee behaviour with no brood in July and two brood peaks in, maybe, April and September. Needless to say, this will make significant changes to swarm impulse and our management practices.

Management to prevent swarming

At our early spring inspection, we check for many things including the presence of sufficient stores, but this inspection should also assess whether the colony is congested with stores. This can be a particular problem in smaller hives such as modified Nationals and WBCs. However, if you have a store of frames containing clean, drawn, empty brood comb it is a simple matter to take out end frames and insert new drawn comb next to the brood nest. These combs are easily produced by using brood boxes containing frames of foundation as supers in the previous season, and extracting the honey. As the season progresses, we need to ensure there is sufficient super space and the 'rule of thumb' is to add a super when the previous one is about two-thirds full. Adding supers at an earlier stage tends to cause 'chimneying' where the end frames in the supers are left unused. Requeening with a young fecund queen also reduces the swarming impulse. It appears that varroa infestations increase the swarming impulse, so efficient varroa control becomes an important part of swarm control.

Size does matter

In my view there is no doubt that the smaller hives, without good management practices, are generally too small for most bees used in the UK. After all, a reasonably good queen can lay 2,000 eggs per day when a colony is building up, but a modified National hive, theoretically, only has space for laying a maximum of 1,247 eggs per day. This creates a classic swarm impulse caused by congestion. A 'Demaree' can be performed to reduce this impulse. This procedure is used to give the queen more laying space before the swarm impulse arises, so it should not be used if there are eggs or larvae in queen cells.

Demaree procedure

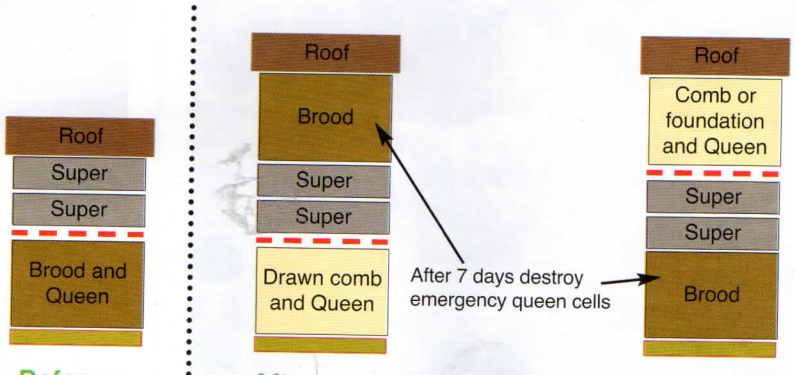
Examine the colony and find the queen. Make sure she is on a frame of brood and place her in another clean brood chamber filled with frames of clean, empty, drawn comb. Reassemble the hive in the following order from the ground upwards: Floor; Brood box containing queen and drawn comb; Queen excluder; Supers; Original brood box containing frames of brood; Crown board; Roof (see figure 1; left-hand panel). Because the original brood is now at a distance from the queen there is insufficient queen pheromone present and a swarm impulse occurs in this box. Therefore, after seven days it is essential to examine these frames and destroy any queen cells present.

With this system it is not possible to use frames of foundation, only drawn comb is suitable. This is because, with the brood on top, the young bees will tend to remain there and the foundation will not be drawn out efficiently and thus will become dirty and spoilt.

A variation of Demaree

A variation is to reassemble the hive as follows, again from the ground upwards: Floor; Original box containing frames of brood; Supers; Queen excluder; Brood box containing queen and drawn comb; Crown board; Roof (see figure 1, right-hand panel). This variation is useful if you wish to change old brood comb, because it is possible to use frames of foundation in the

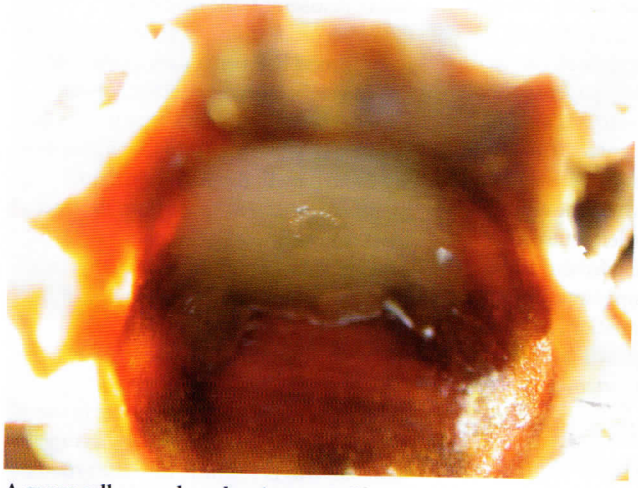
Figure 1. The Demaree procedure and a variation



top brood box and when the brood has hatched in the lower box, the bees tend to move any suitable unused stores upwards as the combs are abandoned. Once this happens the old brood box and combs can be removed, and the hive reassembled in the conventional manner.

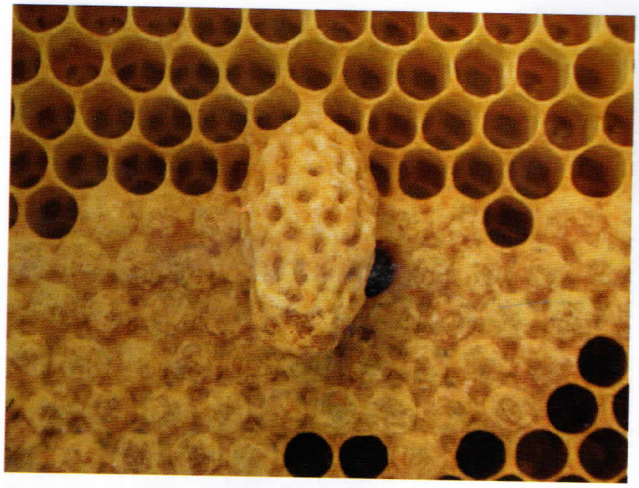
Swarm control

In normal bee management, colonies are examined every nine days and if no queen eggs, larvae or sealed cells are present then the colony can be closed up until the next inspection. There is no risk of a swarm emerging before the next nine-day examination, because colonies do not usually swarm until queen cells are sealed. If clipped queens are used, this inspection period can be increased to fourteen days, but there is a risk of swarming at the end of the period. If this were to happen though, the swarm would lose its queen and return to the hive, but this subject must be left to another article.



A queen cell opened up showing a suitable larva on a good pool of royal jelly. All photos are by Richard Ball.

When eggs or larvae in queen cells are found it is common practice to destroy them. This is probably fine on first discovery, but repeated destruction usually ends in disaster when a cell is missed and, in any case, colonies treated this way become disillusioned and fail to perform. It is better to follow the bees and manage their natural desire. There are many techniques to do this and, in this article, we will only consider the principal ones. Most rely on the fact that flying bees return to the site of their hive, not to the hive itself. To demonstrate this, move one of your hives say 70 cms to one side and observe the returning forager bees. They will fly to the original position, become confused and circle around for some time before finding their own hive. If another hive is placed on the original location the foraging bees use it as their own. A process of deliberately drifting bees in this way is the basis of the artificial swarm.



You are too late if queen cells are like this!

Artificial swarm techniques

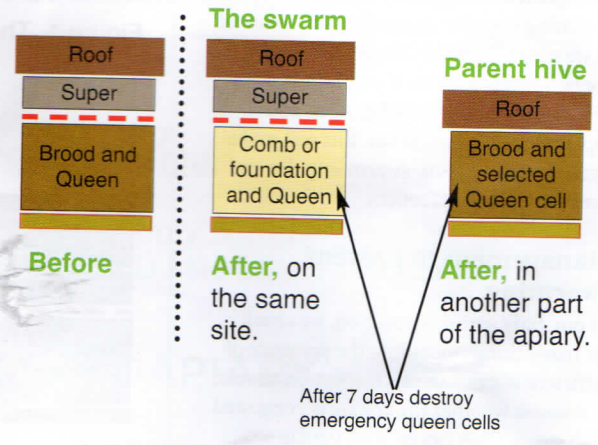
The main techniques are called Pagden, Heddon and Snelgrove, which many beekeepers develop to suit their own needs. These methods have also been developed to control varroa. Here we will concentrate on and fully describe Pagden and Heddon. When performing these techniques, it is essential that the bees are flying freely on a nice warm, dry day.

Pagden

When queen eggs or larvae are found, a new hive, filled with foundation or clean, drawn comb, is placed by the hive being examined. Then:

- The queen is found and if she is on a frame of sealed brood, the frame is placed in the centre of the new hive. If the queen is on open brood it easy to hold a frame of sealed brood above and against it, then by gently smoking she can be moved up onto it.
- The original hive, known as the 'parent' is then moved to another site in the apiary.
- The new hive, known as the 'swarm' with the queen, one frame of sealed brood and frames of foundation or drawn comb is placed on the original site. The queen excluder and any supers are placed on this hive and it is closed up. Bees returning from foraging join the bees in the supers and the queen.
- The parent colony is then fully examined and one open queen cell with a healthy larva on an abundant bed of royal jelly is selected. It is best to select one which will not be damaged by subsequent examinations. Mark the frame top bar above its location so you know which you selected. A drawing pin is useful for this. Carefully examine the rest of the frame and destroy any other queen cells. Do not shake the bees off this comb due the risk of dislodging your chosen larva. Then examine every other brood frame and destroy any queen cells present on these frames. It is best to shake off the bees so as not to overlook any. Check they have sufficient stores until the next examination. When completed, close up the hive.
- After seven days examine the parent colony and destroy any emergency queen cells built. Be careful not to shake the marked comb or destroy your chosen cell.
- Also examine the swarm colony, as when a colony is artificially swarmed it does not necessarily settle down in its new home despite the presence of brood. Much depends on the state of advancement of the swarming impulse in the original hive, so you may find developing queen cells. These can be destroyed.

Figure 2. The Pagden artificial swarm method



Although Pagden can work well, an imbalance between swarm and parent occurs. This is because although the parent stock is depleted of flying bees it soon gathers impetus as the brood hatches out and the new queen rapidly increases egg-laying. The swarm colony on the other hand, although strong after the manipulation, soon dwindles. You may wish to consider this relative to late nectar flows.

The question of using foundation or drawn comb in the swarm colony remains. Generally, there is no choice as the beekeeper does not have clean drawn comb. If the swarm is created during or immediately before a good nectar flow, it is best to use foundation, as the bees will be forced to store nectar in the supers and good comb will be drawn in the brood box for the queen to lay eggs in. However, if the nectar flow is poor or non-existent, foundation tends to become dirty, nibbled and spoilt, so clean drawn comb is a better choice and it gives the queen comb to lay eggs in. The danger with using drawn comb is that if a nectar flow begins, then the combs become clogged with stores. To make the right choice requires a good knowledge of local circumstances and an assessment of forthcoming weather.

Heddon

This is a refinement of Pagden and creates a more balanced split. The artificial swarm is made up in exactly the same way as in Pagden. The queen is found and if she is on a frame of sealed brood the frame is placed in the centre of the new hive. If the queen is on open brood it easy to hold a frame of sealed brood above and against it, then by gently smoking she can be moved up onto it (see figure 3).

- Day 1: The parent colony is moved to one side and the new hive, known as the 'swarm' with the queen, one frame of sealed brood and frames of foundation or drawn comb is placed on the original site. The queen excluder and any supers are placed on this hive and it is closed up. Bees returning from foraging join the bees in the supers and the queen. The parent colony is now placed next to the swarm colony with the entrance facing away and at right angles to the original entrance.
- Day 3: After two days, the parent is moved to the other side of the swarm with the entrance facing away and turned through 180⁰ from the direction it faced on day 1.
- Day 5: After a further two days the parent is moved to another part of the apiary.

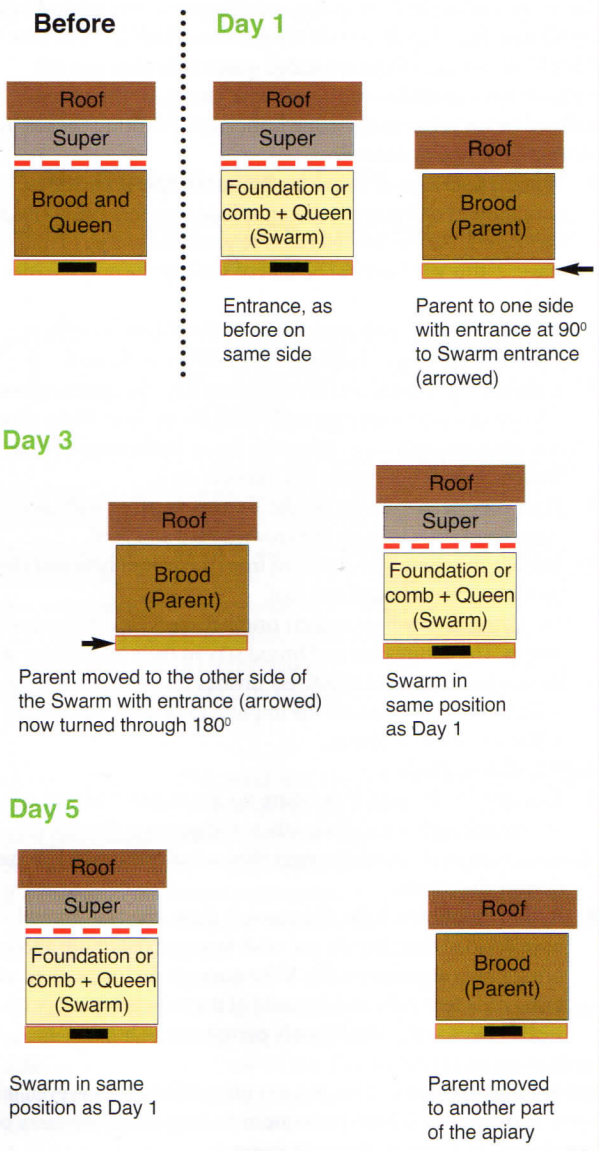
The purpose of these movements is to drift bees off from the parent to the swarm colony to strengthen it and to weaken the parent colony, so that it is unlikely to throw a caste swarm, thereby saving the need to examine the parent colony for queen cells.

Both of these methods rely on drifting bees from side to side and they require an extra complete hive. By drifting bees up and down a hive, using the Snelgrove method, a saving of a floor and roof can be made. However, the Snelgrove method is more suited to a single-walled hive, because with double-walled hives an entrance tube, known as a 'Shepherd tube', needs to be created through the void between the inner and outer walls for the upper parent colony.

Snelgrove

The artificial swarm is made up in exactly the same way as in Pagden as shown in day 1 in figure 3. The new hive, known as the 'swarm' with the queen, one frame of sealed brood and frames of foundation or drawn comb is placed on the original site. The queen excluder and any supers are placed on this hive. A Snelgrove board is then placed on it and the parent colony placed on top. The Snelgrove board permits colony odours to be exchanged between the parent and swarm, and by manipulating a number of doors, bees can be drifted between the upper and lower boxes to simulate the Heddon method.

Figure 3. The Heddon artificial swarm method



This method works well but many beekeepers find it fiddly and tend to do it once and move on to something they prefer. I would recommend reading LE Snelgrove's book *Swarming – Its Control and Prevention* for full directions.

Modifying Snelgrove

Beekeepers often modify Snelgrove's method using standard equipment and it is particularly suited to smaller hives. A standard crown board is adapted so that on the top surface a section is cut out of the bead on one side, then by using a small pin or screw it is converted to a fold-out entrance. An artificial swarm is created in exactly the same way as for Pagden and when reassembled the crown board is put on, the feed holes completely closed off with a piece of plywood, and the parent colony is placed on top with the fold-out entrance open and facing to the rear. Bees can be bled off as in Heddon by turning the parent colony and crown board through 180⁰ over two consecutive two-day periods.

The disadvantages with these methods are that bees fly at head height and brood boxes, being high up, are difficult and heavy to handle when examining the colony. However, they do save equipment and space.

Cannot find the queen?

All the methods described above require the beekeeper to find the queen, but I have found that many beekeepers have difficulty with this or just cannot find the queen, resulting in swarm control being abandoned. So, what do you do if you cannot find her? The first thing to say is that if there are sealed queen cells then you are probably too late, and a swarm will have emerged. The system outlined below relies on the same principles of drifting bees as in conventional swarm control.

- When queen eggs or larvae are found the hive is moved to another part of the apiary, being at least four feet away. This is the 'Parent'. As the bees bleed off to go to the swarm hive at stage '2' this will have the benefit of making the queen easier to find.
- A new hive filled with foundation or clean drawn comb, is placed on the original colony's site. This is the 'Swarm'.
- Examine the 'Parent', and if you cannot find the queen, remove a frame of brood with eggs and young brood in it. Make sure it has no queen cells on it. Place this frame in the centre of the 'Swarm', it does not matter if it has bees on it.
- Place the queen excluder on the 'Swarm' together with any supers and close up with the crown board and roof.
- Replace the comb you removed from the parent hive and close up with a crown board and roof.
  The flying bees will go to their original site where the swarm hive is. The young bees and brood stay in their parent hive at its new location. This effectively divides the colony in half and will in most cases remove the impulse to swarm. The queen will be in one of the hives.

Stage 2; after seven days:

- Examine the 'Swarm'. If there are no queen cells and you can see worker eggs, then this is where the queen is. If there are queen cells and no worker eggs then select one queen cell and destroy the others.
- In the parent hive, if the old queen is there, the bees should have decided that they do not wish to swarm anymore and will break down any queen cells. If the queen is not there, they will bring on queen cells and, because of the reduced number of worker bees, will probably only permit one to hatch.

It is not a guaranteed system, but it is often effective. However, it is better to develop and hone your queen finding skills, and carry out more effective methods of swarm control.

By controlling swarms with these methods, you start with one colony and end up with two. This may appear great, but if nothing is done and you have no losses the number of hives you have will increase exponentially. So, if you have two hives in year one, and you artificially swarm each colony each season, you will have 1,024 in ten years; rather expensive in hives and you will be a bee farmer! It is normal practice to re-unite the hives when the new queen is performing satisfactorily, and cull the old queen. However, it may be a prudent management practice to run the two colonies through the winter and unite in early spring, thus creating a very strong colony to maximise honey production on spring nectar flows and hedging your bets against some winter losses.

Using an artificial swarm for varroa control

In the 1990s, as varroa swept across Europe, a lot of varroa research was carried out. It was clear to many that just reaching for the chemical or medicine pot for control was not good for bees and was not the only answer. A lot of work was put into developing biotechnical controls. The principle behind most of these is that if a colony is broodless, all the varroa mites will be on adult bees, the so called phoretic phase, so when a frame of open brood is presented all the mature varroa mites enter this brood to carry out their reproductive phase. When this frame of brood is capped it is removed and destroyed. This technique will remove 90% of the varroa mites in a hive. If two frames of brood are used it is increased to 95% of mites. This efficacy is greater than most medicinal treatments currently available. Many beekeepers worry about the loss of bee brood, but when timed in regard to local nectar flows and conditions, it can increase honey yields and the colony will recover its full strength before late summer. In my conditions, I find the end of May and early June are most effective for these procedures.

Researchers in Germany and elsewhere developed this principle into queen trapping and the use of artificial swarms. The biggest problem with these techniques is that as they are performed early or mid-season, so there is a risk of reinfestation from other collapsing and heavily infested colonies. This is where, if you are unlucky enough to have neighbouring colonies with uncontrolled varroa populations that are collapsing, the remaining able-bodied bees abandon their hives and find a home in other nearby hives. These bees carry a significant number of varroa mites and will reinfest the controlled colony.

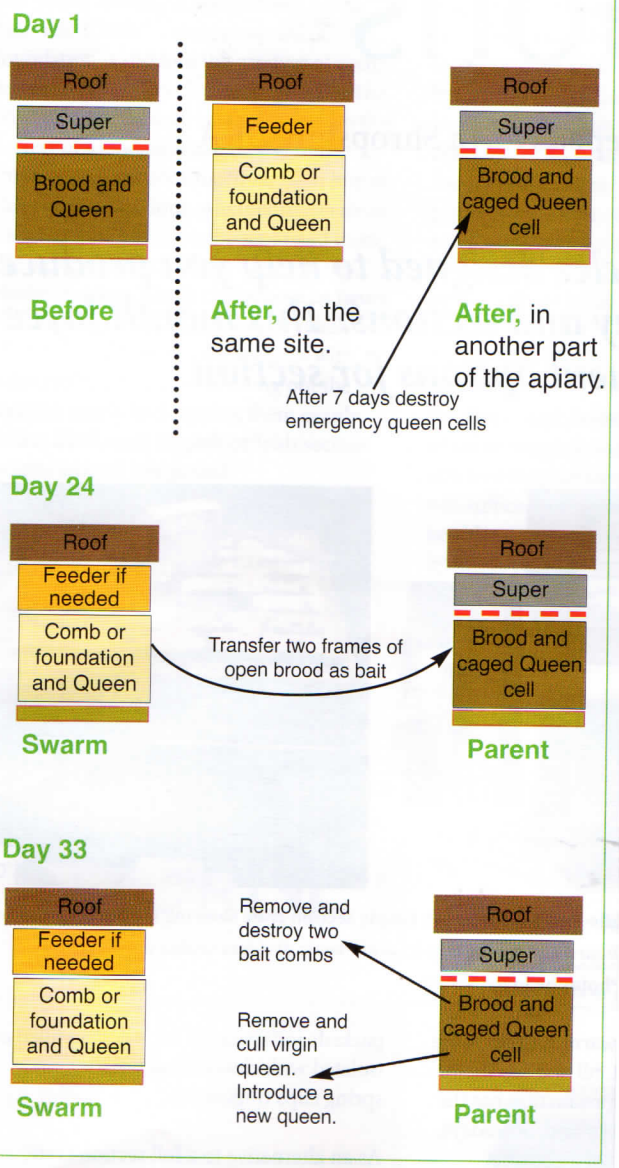
Method for artificial swarm to control varroa

This method is illustrated in figure 4. Initially, the queen is found and if she is on a frame of sealed brood the frame is placed in the centre of a new hive. If the queen is on open brood it is easy to hold a frame of sealed brood above and against it, then by gently smoking she can be moved up onto it.

- Day 1: The original hive, known as the 'parent' is then moved to another site in the apiary at least four metres away.
  The new hive, known as the 'swarm' with the queen, one frame of sealed brood and frames of foundation or drawn comb is placed on the original site. The hive is closed up with a new crown board and roof. As this hive has no stores it will need feeding unless there is a very good nectar flow. It is best to use a contact feeder. Bees returning from foraging join this colony.
- The parent colony is then fully examined and one queen cell with a healthy larva on an abundant bed of royal jelly is selected. This cell is caged so that the emerging virgin cannot leave the hive to mate. It is best to select a cell in a convenient position and mark the comb with a drawing pin. Carefully examine the rest of the frame and destroy any other queen cells. Then examine every other brood frame and destroy any queen cells present on these frames. It is best to shake off the bees so as not to overlook any. The queen excluder and any supers are placed on this parent hive and it is closed up.
- Day 8: Examine the parent colony and destroy any emergency queen cells built. Be careful not to shake the marked comb which may damage the selected cell or dislodge the cage.
- Day 24: The parent colony will be broodless, so two frames of open brood are taken from the swarm colony, being careful to shake off any bees, and placed in the parent colony.
- Day 33: When these frames are sealed, 9–11 days later, they can be removed and destroyed. The virgin queen should then be culled and the colony requeened with a new vigorous queen.

There is no need to bait the swarm colony because, unless a colony is collapsing, flying bees do not carry varroa mites. The so-called phoretic varroa mites on adult bees tend to feed on the young bees that they emerged from the brood cells with until they are mature and ready to reproduce. In a natural swarm, rather than one generated by drifting foragers, the bees are a cross-section of ages, so a collected swarm will have a substantial number of young bees and will carry a varroa mite burden. The virgin queen needs to be culled because she will be too old to mate satisfactorily. If left, the colony will probably collapse. Instead of destroying the frames of sealed brood, it is possible to uncap them and wash the larvae and varroa out of the combs with warm water, so the combs can be reused. Personally, I find this rather labour-intensive so prefer to destroy them.

Figure 4. Artificial swarm for varroa control



Adapting Pagden to help control varroa

In the UK, I find that strong colonies which are artificially swarmed tend to go into a broodless state for a period before the new queen is laying. This is a suitable time to bait the colony with two frames of open brood. My observations of varroa levels in artificial swarms by the conventional Pagden method are that the varroa level remains low in the swarm colony and high in the parent. So if you wish use the conventional Pagden method you can bait the parent colony during its broodless period with considerable effect. Carry out steps 1 to 6 in the Pagden section above and then:

- After 24 days examine the Swarm colony and remove one or two frames of open brood. Examine the Parent, make sure it is broodless and place the open brood frames into the brood box. Make sure no bees are on the combs and mark the frames. Replace the frames removed from the Swarm with those removed from the Parent. Make sure no bees are on these combs.
- After 9–11 days remove the marked frames and destroy them.

Swarms are often seen by non-beekeepers as a public nuisance, so efficient swarm control is an essential element of responsible beekeeping. The basics of swarm control are outlined here so please learn and practise how to find queens and find and develop a system that is effective for you.