**C&G Occasional Guidance Note No. 2**

**"Help, my bees are swarming" - Swarms and Swarm Control**

**(Collecting swarms is dealt with elsewhere)**

## Introduction

Note No. 1 referred to one of our members who thought his bees were swarming last Saturday (1st June) On Tuesday, he checked his hive and cut out all the queen cells – thus making the colony hopelessly queenless. There are several lessons here. This is an update of the guidance that we put on the website and includes more on cutting out queen cells. The most important lesson is not to do something before you are certain of why you are doing it. A beekeeper elsewhere in the country tells the story of how he was supervising a demonstration, was distracted by what was going on in an observation hive, and to his horror realised that the demonstrator cut out the single queen cell saying "that is supersedure, and we can get rid of it." In fact the colony had tried to swarm, the queen had been removed and a single open queen cell left. In effect, it was an artificial supersedure. This illustrates the need to know the condition of the colony, and for that it is essential to keep a good record, or have a very good memory!

Swarming is an inevitable and essential part of honey-bee behaviour. In the past beekeepers have tried to eliminate swarming – and failed! Especially in urban areas, swarming can be a nuisance to both the beekeeper and the general public. For the beekeeper, loss of a prime swarm can rule out much chance of securing a honey crop. For householders, while arrival of a swarm can be an exciting and educational experience, there can be a risk to bystanders and the adoption of a chimney or hollow wall by the bees can create a nuisance. In some cases the only solution is to destroy the bees.

## What is meant by a swarm

People who are not familiar with honey bees often confuse large numbers of flying insects with honey bee swarms. Only honey bees form true swarms.

## Why honey bees swarm

Strong and healthy colonies swarm to reproduce the colony, disperse locally, and to escape from pests and diseases. When conditions are suitable, the colony starts to build a few or many queen cells in which daughter queens are raised. If unchecked, a prime swarm will emerge when the first queen cells are capped, about 8 days after the egg is laid. In good weather one or more after-swarms or casts will emerge, further weakening the original stock, but giving the colony the chance of multiplying exponentially. Remember that *Apis mellifera* was originally a tropical insect and nearer the equator there may be no cold season and so bees may be active all year.

We still do not know enough to always predict when bees will swarm. Factors that may play a part are over-crowding, lack of space for the queen to lay, an old queen, the strain or genetics of the colony, or a nectar flow coming to an end. The mechanism of communication within the colony by pheromones is now fairly well understood. *Queen mandibular pheromone* is passed from the queen to the workers while *Queen tarsal pheromone* is deposited on the comb where it can be detected by the workers. If workers pick up both pheromones then production of queen cells, and therefore swarming, is inhibited.

It is thought that congestion can trigger swarming due to the crowding of the workers disrupting distribution of pheromones. Congestion may be caused by the workers not passing through a queen excluder (particularly a metal excluder in cold weather). Early in the season, placing supers over the crown boards gives workers access to the super, and once they have started drawing comb, the queen excluder can be inserted and the crown board moved up

## Types of swarm

Emergence of a large prime swarm is a wonder of nature. Even a small cast can contain sufficient bees to create a large effect. These true swarms usually occur during late April to mid-July and typically emerge about the middle of a warm day.

Worker bees sometimes leave the hive when a virgin queen goes out on a mating flight; it seems that these mating swarms can sometimes become disoriented and fail to return to the hive. These swarms may not follow normal behaviour.

Workers in true swarms normally emerge after gorging on honey and are very docile; bees in abnormal swarms may be quite the opposite! There seem to be more reports of anomalous swarms than ever before. Anecdotal evidence suggests that bees may be responding to adverse conditions in the hive. Tropical strains of bee have a stronger tendency to abscond than temperate strains, i.e. more or less the entire colony abandons the nest or hive, perhaps in response to fire or predators. Late swarms about mid-August may be the result of the beekeeper using some *Varroa* treatments which irritate the bees and cause them to abscond. Other irritants might be high *Varroa* loads or contamination in wax foundation.

Another anomalous situation occurs when a swarm is collected during the day (perhaps by a pest controller more interested in payment than doing a proper job) and a portion of the flying bees are left behind. The orphan workers will not stay in a hive and try to cluster until they are killed by bad weather.

A similar situation may arise when a swarm emerges with a clipped queen. I have seen a reasonably compact swarm but the queen is still inside the hive. In that case, I artificial swarmed the colony and by the time I had finished the entire swarm had returned to the hive. If someone collected the cluster at the critical time and took it away, they would be puzzled by the hectic behaviour of the queenless bees.

Another potentially dangerous swarm is created when a bee inspector carries out a shook swarm control of EFB and the beekeeper removes the queen excluder under the brood chamber too early, thus allowing the bees to abscond. Until the bees have exhausted the honey in their crops by building fresh wax, this swarm can be a source of EFB infection.

Remember that a queen will leave a scent (the footprint pheromone) wherever she has been. Workers will cluster on a branch or something like a used queen cage long after the queen has moved on.

## The value of swarms

Beekeepers have traditionally valued swarms highly; once hived a strong swarm will work hard and draw out good quality comb and may give a honey crop in the first season. Nowadays, swarms must be treated with caution and it is good practice to quarantine swarms away from the main apiary until they have been ‘proved’. The greatest risk is that the bees carry American Foul Brood (AFB). Remember that

this is a notifiable bee disease and that the only (and legally enforced) treatment is total destruction of the colony. There has recently been a case of a beekeeping association helping beginners collect a swarm which was eventually diagnosed with AFB. Eventually, the infection was traced back to a wild colony that had swarmed several times, but not before stocks had been distributed among members and caused a serious outbreak! Only beekeepers that can be relied on to inspect the brood regularly and recognise early signs of AFB should be dealing with swarms. Pam Gregory has written an excellent article covering this issue [Bee Craft, October 2010, Vol 92, No 10, pp 30-1]

Nearer to home, there have been cases of EFB that seem to be the result of sale of infected bees to beginners. If these were acquired in 2011 and the beginner lost a swarm last year, an experienced beekeeper who has brought them through the winter may find evidence of EFB this year. A novice with only one colony is effectively setting up their own quarantine apiary, but in town single colony apiaries can be very close together. When the beekeeper builds up their stocks after a few years, they must consider isolating swarms until they have been checked for health.

Despite the cautions, swarms are a potential source of near-native or locally adapted bees that can be a great benefit. Any swarm can be re-queened with a selected queen.

**How bees swarm**

Even if the beekeeper is unaware of when his bees will swarm, the bees 'know' that they are preparing to swarm. Scout bees will search for suitable nest sites and this behaviour may be observed, especially where bait hives have been set up by a canny beekeeper. Sometimes a householder becomes aware of this scouting activity which can become quite intense with some workers 'loitering' in a potential nest overnight.

When the swarm is triggered, a large proportion of the workers leave accompanied by the queen which has slimmed down and so is able to fly. About 70% of the swarm consists of young bees less than ten days old. The movement of the swarm is largely controlled by the scout bees; the queen does not lead. On leaving the hive, the swarm will usually hang-up on a shrub or tree. The exact position seems to be determined by where the queen settles, with the workers responding to her pheromones, although clipped queens may never get that far,; but swarms clearly favour certain foliage types and certain heights, and an experienced beekeeper can learn where swarms are more likely to be found. Usually, the workers form a cluster around the queen and then form the distinctive 'rugby ball'. In this state the bees are easy to collect. Sometimes the bees cluster but form separate strands and this might indicate that there is more than one queen – perhaps after-swarms with virgin queens have emerged about the same time and coalesced.

If bad weather sets in, the cluster may hang-up for several days; workers may begin to consume their honey stores and may become bad-tempered. If all goes well scout bees perform waggle dances on the surface of the cluster and recruit workers to their preferred nest site. It is thought that when all workers have been recruited to one dance the swarm is ready to move to its new permanent home; thus every worker 'knows' where it is going. In this phase the swarm may travel a considerable distance – easily several kilometres. If the swarm has chosen a nest in an inaccessible place (e.g. behind an air-brick in a wall) then, once the queen has entered, and particularly if comb is built and eggs are laid (easily within 24 hours of arrival if the queen is mated), it will be extremely difficult to dislodge the swarm. It is

therefore better to control swarming and avoid the hassle of trying to recover wild swarms from impossible places.

**Swarm Control**

Numerous methods have been devised by beekeepers to control swarming. Some, such as killing the queen, or taking out a few frames, can be effective but are brutal and may disrupt rather than manage the swarming tendency. The best methods mimic the natural swarming process: the beekeeper carries out an artificial swarm. The principle is to separate the queen with most of the flying bees from the brood with sufficient house bees to maintain it. Good methods should allow a new queen to be raised so that the beekeeper can replace the old queen with a newly-mated daughter. Since queen rearing in the colony is linked with swarming, the beekeeper can utilise the natural swarming tendency of the bees as the basis of deliberate queen rearing intended to improve the quality of the bees. Traditionally, this bee-breeding was aimed at increasing honey- crop yields, but today there may be more (or at least equal) emphasis on gentle/ easy-handling bees, disease resistance, or nativeness.

Pagden (from Sussex) published his methods about 1870 while George Demaree (1832-1915) introduced his method in the American Bee Journal in 1884. Snelgrove (Somerset) gave a comprehensive account of various methods based on his Snelgrove board in 1934. Since then, simplified techniques using less-complicated swarm-control boards have been developed.

**Know your queen cells**

Swarm queen cells are usually found on the sides and bottom edge of brood comb. Depending on the strain of the bees, they may produce just a few or dozens of swarm cells; remember they can be built in odd shapes squeezed into corners. Some strains of honeybee tend to supersede queens rather than reproduce by just swarming. There is usually a single supersedure cell near the centre of the comb which is large and strongly sculptured. Emergency queen cells are built from worker cells rather than queen cups and so ‘droop’ from the comb; they may be quite small and be easily overlooked.

**Swarm deterrence**

The beekeeper can reduce the likelihood of their bees swarming by giving space to reduce over-crowding, and replacing old queens by queen rearing. Beginners may induce swarming by over-enthusiastic manipulation – so open the hive for weekly inspections only – do not be tempted to ‘show-off’ your new-found skills at the expense of your bees. Someone worked out that 2lbs of honey production is lost every time the hive is opened! Bees are sometimes reluctant to move through a queen excluder and occupy a super fitted with foundation; they thus become over-crowded in the brood box – and swarm! Early in the season the super may be placed over a crown board or the bees given full access to the super. The queen excluder is inserted once the bees are drawing comb.

**Cutting out queen cells**

This is not an effective method of swarm control nor a very sensible bee husbandry. It seems that very often a beekeeper will see queen cells – and panic! If queen cells are found, the first thing to do is to establish the state of the colony. If the colony is preparing to swarm then the brood area is likely to be full of bees and even experienced beekeepers may fail to find the queen – especially if she is not marked. Other signs must be looked for. If the pattern of eggs (not brood) is complete and there are only minimal

patches of nectar stored in the laying area, then the queen is likely to be present. If the bees are behaving 'normally', then they are picking up pheromone and know she is with them (but not necessarily where the beekeeper wants her!

Only when the presence of the queen has been confirmed should any queen cells be cut out. If queen cells have been started, a decision must be made about what method of artificial swarm control can be used. In a queen right colony determined to swarm advanced queen cells can be cut out to delay departure of the swarm until the beekeeper has gathered the necessary equipment, but if the bees have reached the 'tipping point', then they might not detect the loss of the (sealed) queen cells and depart anyway. If the queen cells are only 5 or 6 days old, then the beekeeper should have time to get organised, but they might leave soon after eggs have been laid in queen cups.

Queen cells can be cut out after swarm control to limit the production of further virgins that can trigger castes (see the methods below).

**Finding the queen**

The only sure way of finding the queen is to kill the entire colony and sort through the dead bees until she is found! If the beekeeper has to find the queen, these ideas should help.

1. When searching a frame for the queen it is better to adopt a 'track' to ensure that the whole frame is checked. Start going from side to side, then up and down, check the edges and any nooks and crannies as you turn the frame. Remember that the queen might be laying an egg and so only her thorax, head and legs will be visible. By checking twice, you should catch the queen between egg layings. Take every opportunity to see a queen when you attend demonstrations and become familiar with how she differs from the workers in both appearance and behaviour. When searching for the queen, do not try to do anything else. Leave checking for brood disease etc, until another time.

2. When going through the brood frames, set up two spare brood boxes, both behind the hive being examined. As each frame is removed and inspected, it is placed in one of the new brood boxes. If the queen is found on a frame, this frame is placed in the third box. If the colony is to be swarm controlled then foundation can be added to this box to start the new shook/ atificial swarm. In time the behaviour of the bees may indicate where the queen is. The bees in the now queenless portion may become agitated – and the other box searched. By placing the frames behind the stand, the flying bees will return to the original hive, thus thinning out the bees in the new boxes and making further searches somewhat easier.

3. If all that doesn't work, the frames (especially those with brood) can be moved apart in pairs. After a while the queen should move between the two frames. Each pair of frames can be quickly checked and she is likely to be there in the centre of a frame.

4. If that doesn't work, set up a brood box with a queen excluder on top and then another brood box above that. Shake the bees off each frame and into the upper brood box. Quickly insert the cleared brood frames in the lower brood box. The workers will migrate through the queen excluder to re-cover the brood – hopefully leaving the queen trapped on top of the queen excluder.

If that doesn't work – sit down and have a hard think, close everything up, and come back a few days later for another try!

## Clipping and marking queens

In early April the queen should be clipped and marked. Marking makes it easier to find the queen on the comb, easier to spot her in a swarm, and allows the beekeeper to determine whether she has been replaced. If international queen marking colours are used, then the age of the queen can be seen at a glance. A proportion of collected swarms are found with a clipped queen which is still able to fly, so the entire membranes of the forewing on one side almost down to the root should be removed. If an open-mesh floor is used and the queen is clipped, then it is worth arranging the hive with a space beneath the floor. If a swarm 'gets away' then the queen often walks back under the floor and the queenless swarm returns and clusters on her. The busy (or lazy!) beekeeper can then create a belated artificial swarm with a good chance of success.

If a queen is clipped, leaves the hive, but cannot fly very far, she might settle on the ground and workers from the swarm cluster on her. Keep this in mind and tread carefully in the apiary; a little smoke and a quick search might find her. If you have marked your queens in different ways (colour, size, or position of the spot on the thorax, and wings clipped in different ways) you can then work out which colony she came from.

By always clipping queens the beekeeper applies a (small) selection pressure favouring supersedure. For beginners who have yet to learn to pick up a queen and clip her safely, the fail-safe method is to use a press-in cage. Workers must be excluded and once the queen is trapped the cage is pressed down in front of the queen. She will then back away and a wing will pass through the mesh. The cage is pressed down to immobilise the queen and fine scissors used to clip one forewing. She can be marked at the same time, but do not allow paint to spread to wing and leg joints! If the queen is removed from the comb do not drop her back on (the workers may react as if she is an intruder and kill her); clear workers from the comb with smoke, place the queen carefully and when she is walking on the comb and dives between frames allow workers to approach. If the queen drops badly you may see workers approaching the queen 'with menaces'. If a worker seems to clinging on to the queen and flexing her abdomen as if to sting, then the individual worker can be deterred by gently pressing against her and letting the queen run away. If workers start balling the queen she is most likely to be killed. Be ready with a queen cage and remove her (with no attendant workers in the cage). You can then try re-introducing her using the queen cage as an introduction cage with candy blocking the exit. However, it is possible that the workers were already detecting that the queen was failing (this might be why they are producing queen cells) and they will reject her whatever the beekeeper does.

Those who advocate 'natural' beekeeping and those applying 'organic' standards sometimes outlaw clipping queens. In my view there can be no distress caused by clipping a wing membrane. An old queen will naturally suffer damage to her wings so that she cannot fly. Thus the beekeeper is using natural phenomena to manage the bees. To me 'natural beekeeping' is a contradiction: bees have natural behaviour and any intervention by the beekeeper is un-natural – the art is to work with the bees natural behaviours. I see no purpose in applying anthropocentric sentiment to our wonderful hobby!

Cutting out queen cells is not a clever way of preventing swarming. It should only be used when queen cells are found but the beekeeper does not have equipment to hand to deal with the situation. Bees can

raise an emergency queen from a 36 hour larva, thus the old queen can leave when a cell is sealed only three days later. Repeated cutting out may induce a swarm to leave before queen cells are sealed.

## Equipment

It is impossible to properly manage bees without spare equipment. If the beekeeper simply collects swarms then complete hives will eventually be needed to house them. To ensure swarming can be dealt with effectively, there should be a spare brood box and frames of foundation for every stock, with a nucleus box for every 2 or 3 colonies. A division board modified from a crown board with a hinged entrance on one (upper) side and which can have pieces of queen excluder fixed over the holes for each colony greatly assists coping with swarming.

## Pagden methods

Pagden's original idea involved driving bees from a skep in which open queen cells were found into a second, empty, skep placed above. The beekeeper judged the proportion of bees to be left with the brood and tried to make sure that the queen moved up with the artificial swarm. The new skep placed on the original stand attracted the flying bees, while the original colony in the old skep with brood and queen cells was moved to a new site. This method can be adapted in various ways, with the hives being swapped so that flying bees join the new stock as they emerge from the old brood. The bees in the depleted stock will not be strong enough to swarm and should break down extra queen cells.

**One modern Pagden system** - when the colony is found to have occupied (i.e. open) queen cells, place the queen on a frame of sealed brood in a new brood box made up with foundation or drawn comb on the original site. Move the old brood box away and select one open queen cell. After 7 days check both boxes for queen cells. The old queen should be laying eggs in new comb; if queen cells are being made then the old queen is failing (or has already disappeared) and this colony can be allowed to raise a queen from a selected queen cell. There will probably be emergency queen cells in the old brood box; check that the selected queen cell looks OK and remove the other queen cells. Run both colonies through the following winter then re-unite for the early nectar flow. If the original queen has survived, then she is replaced at this stage.

## The Snelgrove board

This was/is a crown board with a central hole covered in bee-proof mesh and with six hinged entrances in pairs on three sides. After separating the brood from the queen and flying bees by placing the old brood box above the board on top of the supers, newly emerging bees are bled from the top box by switching the paired entrances in succession so that bees fly from the upper entrance but eventually return to the lower and thus join the main stock. This technique requires several visits and so is labour-intensive.

**A modified Snelgrove method** – this requires a crown/ division board with a double entrance on one side and a single entrance on the opposite side. If the queen is found she is placed on a comb without queen cells and one other in a new brood box made up with foundation on the original site. Put all brood and bees into a second brood box. Rebuild the colony with a queen excluder, the supers and then the Snelgrove board with the front upper entrance open. Place the second brood box on top and close with crown board and roof. [If the queen is not found shake all bees into the bottom box and leave out the Snelgrove board; return after one day when the house bees will have migrated up to the brood and insert

the Snelgrove board as above. Otherwise replace the bee-proof mesh with pieces of queen excluder and operate a Demaree or two-queen system – see below] After ten days close the front upper entrance in the board, open the front lower entrance, and open the rear upper entrance. The flying bees that have used the upper front entrance will return to the lower chamber and join the old queen. After five weeks check for new queen and brood in the upper chamber. If the split was done early in the season the two colonies can be united with the new queen for the start of the main flow.

**A Demaree or two-queen method** – My standard method replaces the bee-proof mesh of the Snelgrove board with pieces of queen excluder, and only uses one upper entrance (I call this a division board). Many of my crown boards are modified in this way and so any hive can be swarm controlled very easily. On finding occupied queen cells, all bees can be shook-swarmed into the new brood box, the house bees moving up to nurse the brood in the top box above the division board very quickly. Traditional advice is to leave two open queen cells, but the first virgin can leave with a large swarm, thus defeating the entire swarm control strategy. It is safer to reduce the first queen cells to one open (occupied) cell and then return five days later when this cell is sealed (take care not to damage it) and remove any new emergency queen cells. An alternative is to start two (or more) queen cells and then set up nucs made up of a single queen cell plus brood and stores. The two brood boxes should be separated by 9 inches of honey boxes. It is therefore difficult to carry out this method early in the season if the bees are trying to swarm from a full brood box. If only a few super frames have honey stores then these can be re-arranged in two supers to create a column of stores to connect the brood boxes. In this case the bees have ample space to carry on collecting honey and the colony can be left alone for many weeks. Occasional checks should be made to ascertain that the old queen is building a new nest of brood (if she was failing then emergency queens may be started and the bees may swarm on these) and that the virgin in the top box gets mated satisfactorily. If all goes well the colony can be split soon after both queens have established brood, but can even be over-wintered as a two-queen colony and split the following year. If there is no wish to increase stocks, the two boxes can be united (there is no need to remove one queen; the bees will sort themselves out the young queen will usually replace the old. This is effectively artificial supersedure) If either queen fails then the hive can be closed down. In either case there may be two brood boxes of good brood comb and the colony can be over-wintered as a double brood box and split the following spring.

**Gloucestershire high-rising -** This method can be used to produce a single three-frame nucleus in which a new queen is raised. If queen cells are found the brood box is moved to one side and a new brood box put in its place. One frame of young brood with attendant bees is placed in the new box and closed up with two frames of foundation. Most of the bees are shaken off the frames in the old brood box but the queen must be kept in it. The old box is placed on top of the supers above a division board as described above.

After 7 to 10 days the boxes are transposed. The single frame should now have queen cells which can be cut down to one to raise a new queen

**Mike Hunt's method –** the hive should be opened and the brood frames examined every 7 to 10 days. Look for queen cells. It is futile to cut these out; there is a high probability that sealed queen cells will be found at the next inspection – the swarm will have gone!

The original box is moved to one side and a new box with foundation put on the stand. <u>All</u> bees are shaken onto the foundation; there is no need to look for the queen – she will be there somewhere! All

queen cells are removed from the now bare frames of brood. The old brood box is re-assembled and placed above the supers; nurse bees will migrate up within an hour. Ten days later return and there should be sealed queen cells built from larvae in this top box. If new queens are raised by other means all these queen cells can be removed, otherwise one can be used to raise a replacement queen. This can be done by making a nucleus and returning the parent hive to the normal state.

An alternative method is to find the queen and place her on a single comb of brood (with no queen cells!) in the bottom box. The emerging bees can be bled down from the top box using a Snelgrove board, or a division board used to separate this top box which can be used to raise a new queen. The hinged entrance is opened to allow the new virgin to fly and mate.

**Going on holiday**

If the beekeeper is going away during the swarming season loss of swarms can be prevented by inducing swarming. Ten days before you go away take a nucleus from the parent hive. This should include the queen, brood in all stages, and stores. Depending on the length of the holiday and the likely weather, a larger (6 frame?) nucleus made up with one or two frames of foundation may ensure that the nucleus can develop. Three days before you go away return to the parent hive and cut out all but one of the queen cells. Enjoy your travels! If there is a likelihood of a strong nectar flow occurring during an extended absence, then space left in the brood chamber should be filled with frames of foundation or a dummy box to avoid bees drawing wild comb there.