

In the apiary — hints and tips on managing the height of the adult honey bee population

Keep abreast of how BBKA research funds are being used

Pros and cons of late requeening are discussed

We consider whether bee space, cell size and hive size matters

Business corner news

BBKA News

The newsletter of the British Beekeepers' Association,
incorporating the **BRITISH BEE JOURNAL**



No: 191 – July 2011



Honey bee anatomy:
Find out more about the structures that bees use to collect nectar, water and pollen on page 13.



Gentle beekeeping:
Can kinder handling methods create more docile bees? Try following some of the guidance on page 18 and find out.



Learning from others:
Cumbria BKA begin this new series by sharing their very successful bee disease day with us, see page 20.

The New BBKA Website has been Launched!

We are pleased to announce that the new BBKA Website was successfully launched on Wednesday 25 May 2011. We hope you will have a look at the site at bbka.org.uk and be pleased with the results.

The site is aimed both inwardly towards the membership to provide you with added value, and outwardly to the general public. There is a great deal of information contained on the website and more will be added in the future. While much is available to the general public, other information is restricted to members, i.e. the people who financially support the BBKA.

Two parts of the website that I would like to remind you of are the ones about finding an association and finding a swarm catcher. At first sight, there might appear to be no link between these two areas, but there is; both are involved in providing information and they will reflect the good quality and amount of information available, so please help us keep these areas up-to-date.

The site will continue to be developed to reflect the needs of associations and you, the

membership. We will keep you updated about this in future issues of *BBKA News*. Do send constructive feedback via the link on the page displayed when you click the 'welcome mat' on the home page.

This has been a massive project over the past twelve months. More detailed and immediate information has been, and will continue to be, distributed to Area Associations with summaries in *BBKA News* so that, together, we can ensure you know what is happening with your website.

The launch went reasonably smoothly but as with anything new, we have had some queries from members. Some of these were addressed in previous *BBKA News* articles, and we discovered a few minor wrinkles that we are working to 'iron out'. In time, we will address all points and we ask for your patience while we resolve any issues.

I do hope that you look at the new site and like what you see but whatever your views, do tell us.

David Teasdale, Chairman,
BBKA Website Working Group



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Chairman's Letter

The question posed to me was: 'Is there any risk your bee suit will be carrying any varroa?' I was on holiday in Tiree (nearly fifty miles off the Scottish mainland) and fulfilling an invitation to visit two new beekeepers in the house opposite who had the only bees on the island. They had imported the bees from the nearby island of Colonsay, one of the few areas of the world currently free from varroa, hence their concern. I had already taken precautions prior to my visit to the island to wash my bee suit and had a new pair of gloves. I was responding to an invitation to visit to give some advice and comment about Jo and Mark's apiary as they — apart from a weekend's training on Colonsay — had had no outside input into their beekeeping, hive location etc. Both hives were strapped down onto pallets; apparently the anemometer had recorded a wind speed of 120 miles per hour last winter before blowing away. This visit has made me think about beekeeping in a slightly broader context:

- Although the smoker was lit, no smoke was used during their hive inspection; apparently that was the way they were shown during their training weekend. While not arguing the pros and cons of this it shows that good and bad influences of beekeeping methods are embedded in trainees early in their training and makes the standardised training methods in CiC something all beekeeping trainers should embrace.
- The concern expressed about being careful not to import varroa is a lesson we should all take note of. Indiscriminate movement of colonies from one part of the UK to another or the importation of queens can undo work of fellow beekeepers and should only be undertaken with these problems in mind — and if possible not at all.
- My involvement was to try and reassure these new beekeepers that they were on the right track and to discuss their beekeeping methods and ambitions. That does show the value of the mentoring process. Perhaps we might lose fewer colonies if less experienced beekeepers felt comfortable about seeking advice, and the more experienced among us offered it readily.
- I looked at these hives in drizzle, a temperature of 12°C and a cool sea breeze. We looked at every comb, without smoke, which suggests to me that by careful thought and application we could all improve the temper of our colonies. I noted the bees from Colonsay were *Apis mellifera mellifera*.

And Tiree, no shopping malls, no rows of gift shops, no dual carriageways around the island, long wide beaches, acres of wild flowers, single track roads (with passing places) and a relaxing environment that meant short journeys could take a long time.

The introduction of the Course in a Case (CiC) training system with its impact upon how beekeeping education is delivered, the maintenance of our close cooperation with the NDB and Fera, and considering whether there should be closer integration of BBKA education and examination systems are areas that need careful thought if we are to see maximum benefit. Consequently I have asked Chris Deaves, Chairman of Education and Husbandry Committee, to head up a working party to consider the interrelationship between these various strands and report to the Trustees by November 2011.

I do not apologise for again taking the opportunity to remind associations to put forward nominees from among their members to stand as Trustees at the January 2012 ADM. I remain available at any time to offer informal advice to all who might be interested.



Brian Ripley, Chairman, BBKA

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In the Apiary

Generally July is the time when honey bee populations are at their highest — ready to work clover, bramble and other summer nectar sources. The adult bees that will forage for the greatest period during this main flow are those developed from eggs that were laid in the last fortnight of April and first fortnight of May. With the exceptional weather in April this year there are reports of many colonies swarming and beekeepers trying to control this. With the resultant reduction in egg laying will there be a reduced foraging force available — or will the season be earlier? Only time will tell.

Many beekeepers will have created artificial swarms and traditionally this is the time that many unite these colonies back together again, culling the old queen and keeping the new. However, is it the most suitable course of action? There is a strong argument to run both parent and swarm colonies through the winter and unite them in the early spring. This gives a hedge against winter losses, maintains colony numbers at a status quo and results in strong foraging forces to maximise the spring crop.

Coinciding with the height of the adult honey bee population is a reduction of the brood nest in preparation for the winter. Varroa mite populations do not reflect this, generally doubling every three to four weeks throughout the spring, summer and autumn. This means that the population of varroa mites that has built up since the last controls are

a problem good practice dictates that varroacides cannot be used as supers are on the hive and there is a nectar flow. Similarly, using thymol will result in tainting the flavour of your honey to a point where it may be unpalatable. With many hive cleansers appearing on the



Varroa mite in floor debris. Photo by Pinguis Imperium.



Parasitic mite syndrome. Photo by Pinguis Imperium.



Bee with deformed wings. Photo by Pinguis Imperium.

clamouring to enter fewer bee brood cells in order to reproduce. This causes an increase in 'multiple mite entry' to bee brood, together with an increase in viral and other bee disease levels in the resultant honey bees. It is therefore important to maintain vigilance and monitor varroa populations through this period, and take action if required. If you do not monitor by using varroa floors or sampling drone brood then look at the bees for signs of deformed wings (see the photo above) and check the brood for signs of parasitic mite syndrome (see photo below). If you find

market it can be tempting to use them but be aware of their contents and the risks of residues — and if used at least follow the directions. Many beekeepers are successfully using icing sugar as a control at this time of year, which can help keep the colony safe until the supers are removed and varroacides can be used. Dusting with icing sugar requires the use of open mesh floors as it causes phoretic varroa mites to fall off adult bees and through the floor. Bees can be dusted in a number of ways ranging from using a sugar shaker with a fine mesh to coat the bees on each brood frame to running

about 125 grams per colony along the brood frame top bars and then brushing it into the bee ways. At least any residues in your honey will be limited to icing sugar — a safe foodstuff.

Putting an extra super on a hive may be required but careful assessment needs to be made especially towards the end of the month when nectar flows may slow or stop. Too much storage space will result in a greater proportion of uncapped cells. Hopefully your supers will be full so be careful with your back when lifting them. If you have not had training in lifting, advice is available from leaflets and the internet. If you think you are going to have difficulty get someone to help you. It makes a huge difference.

Beekeepers taking colonies to the heather will need to check them to ensure that the varroa levels will remain safe for the period they are away, and also to prepare them for the crop and transportation.

During July wasps are frequently seen at beehives. Sometimes you may see a European hornet, *Vespa crabro*. The Asian hornet, *Vespa vellutina*, is present in northern France and will easily transport itself to the UK. Find out what each species looks like and if you suspect a sighting of *V. vellutina* tell your local bee inspector, take digital photos, catch one and kill it in the deep freeze. Send samples to the National Bee Unit for identification. For articles about Asian hornet threats see BBKA News for October 2008 and December 2010.

Pinguis Imperium

BBKA Research Fund Progress Report

The BBKA Research Fund is broke — or let me phrase that better: **all** of the funds available have been allocated to projects which will take us up to 2014 and we desperately need more money to support applications for BBKA research into honey bee health.

Research activities cost a lot of money and, as has been seen from the Insect Pollinators Initiative (IPI), projects can cost several hundred thousand pounds and even around £1M. In spite of these large numbers there are ways in which organisations like the BBKA can help fund research. Often, if applicants can obtain some degree of support, either in cash or in kind from the BBKA, they can approach research funding agencies or grant giving bodies and apply for funding. The BBKA contribution is used in a calculation to help access funds. This is the situation with grants which are called CASE Awards where the BBKA is considered to be an industrial sponsor. These awards are very often for PhD studentships.

Some BBKA-supported research projects

In some cases the BBKA acts as a donor, as has been the case with support for the hygienic bee project at the University of Sussex with Professor Francis Ratnieks as part of the Sussex Plan for Bee Health and Well-being. We offered a three-year donation of £12,000 per year and this is being used to support the work of Gianluigi Bigio, a PhD student, in:

- screening colonies for hygienic behaviour,
- developing the methods that combine intra-colony selection with instrumental insemination,
- developing improved methods for identifying hygienic bees,
- making a comparison of queens inseminated by single males or brother males in a breeding programme.

A second donation has been made to Ron Hoskins, who gave presentations on his work on rearing hygienic bees at this year's BBKA Spring Convention. Ron was awarded £6,000 to provide equipment that will be used to increase the gene pool of selected bee strains, which have shown hygienic behaviour against varroa. The techniques used will include the propagation of colonies, which will be studied by specially trained beekeepers in his association to assess the degree of effectiveness of the bees in removing varroa.

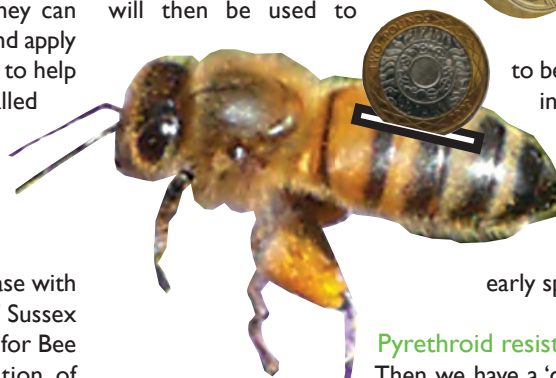
Our first CASE Award has involved a PhD studentship project with the University of Keele; you may have met the team of Dr Falko Driehout and his student Kris Wisniewski on the BBKA stand at the Spring Convention this year. Kris will be working on detecting pesticide residues in the beeswax of honey bee colonies. Pesticides are high on the agenda of concerns with honey bee health and it will be very interesting to see to what extent our honey bees are potentially chronically exposed to pesticide residues. This work is being supported with £4,400 per year for four years as well as some support in kind from BBKA members.

During April, BBKA and the Perry Foundation agreed to support a second project under Dr Falko Driehout at Keele University with a PhD studentship for Richard Bridgett. The support is £4,400 per year for four years. The proposed research project involves collaboration between universities and the BBKA, and will integrate three phases. Firstly, chemical analysis of pollen will be undertaken to isolate and identify potential phagostimulants (substances which encourage eating) with the aim of identifying

individual compounds that can then be tested as phagostimulants in phase two. The second phase will be to use pilot bioassays to test the activity of the extracts and individual compounds. This will be done using small numbers of bees, initially under controlled conditions, with the assistance of the honey bee laboratory at Sheffield University. The results of these trials will then be used to



Photo by Christine Knott.



create artificial diets to be tested within the UK in phase three by a significant number of participating BBKA members feeding their colonies during early spring.

Pyrethroid resistance research

Then we have a 'do it yourself' project, which will be run by the BBKA and involves the help of members. Members of the Northern Cooperative have generously agreed to fund £8,000 for a survey of pyrethroid resistance in varroa this summer in the north of England. It is clear there is a wish to retain the option of using pyrethroids in an integrated bee health management programme, and an up-to-date picture of the presence of resistance is needed. Vita Europe is also participating in this project. We would very much like to include in the same exercise the south of England and to do this we need £5,000. **Please support this project with a donation.**

BBKA winter survival surveys

The BBKA Winter Survival survey is another long-term study and with this year's results we will have four years of directly comparable data. Our survey is quite simple, but the results have considerable importance. The findings are donated to the COLOSS (Prevention of COlony LOSSes) project. The survey and analysis of the survey forms cost money to conduct and in future this should be funded from the BBKA Research Fund.

Other research in need of support

We also have an interest in a number of other projects and we would very much like to support them. One in particular involves the detection and recording of sounds produced from within bee colonies. The sound data is subsequently processed and the sound patterns are interpreted. The results and output from the analysis of the sounds being produced can be used in the management of the colony or as a research tool. The applicant is keen to carry out experimental work to confirm the findings made during the development of the prototype and associated software. This is a really exciting development and a sum of £8,000 is being sought to help fund the experimental and associated computational work.

Please support this project with a donation.

As well as actually funding projects the BBKA is often asked to provide 'letters of support' for grant applications. This involves a team of people in the BBKA carefully reading proposals and

selecting those which we believe will help meet the objectives set out in the *BBKA Honey Bee Research Concepts* document. These applications are in made confidence and so regrettably we cannot write about them at this stage, but there are a number in progress at present.

Now the IPI projects are underway the needs for further research are being identified by the Science and Evidence Advisory Group (SEAG) under the Healthy Bees Plan. The BBKA is also reviewing the progress made in funding research to address the requirements identified in the *BBKA Honey Bee Research Concepts* document. This document still remains the most comprehensive wish list for honey bee research and is frequently cited by applicants seeking research funds. Once we have completed our review we will reissue it in an updated version.

The BBKA Research Fund is ring-fenced and monies that are donated to it can only be used for research purposes. The Technical and Environmental Committee is asked to assess applications made to the BBKA Trustees and then make a recommendation on whether the application should be supported. The decision is taken by the Trustee members of the BBKA Executive. The accounts of the BBKA Research Fund are separately identified.

The BBKA Research Fund needs your support

I am sure you will agree that the data, knowledge and experiences gained from the studies being supported through the BBKA Research Fund will make a difference to the health of our honey bees. The role of the BBKA Research Fund is recognised and we would very much like to have the potential to support more of the applications made to us.

To support more applications we need more funds and I hope what you have read in this article will convince you and your association that monies donated to the Research Fund are valued and deployed in the most cost-effective ways and with maximum potential return.

Please make a donation now. Cheques should be made payable to BBKA, with BBKA Research Fund written on the reverse and sent to the National Beekeeping Centre at Stoneleigh. Where possible, please give the donor's name and address so that they can be invited to 'gift aid' the donation, which would increase the value of the donation at no cost to the donor. Alternatively donate online or via text with Just Giving at <http://www.justgiving.com/bbka> — whether it's a fundraising campaign, one-off or regular donation, just giving is the easy way to contribute.

Dr David Aston, NDB
for the BBKA Research Fund



Photo by Christine Knott.



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BBKA Funded Research Projects

Breeding Disease-Resistant Hygienic Honey Bees and Providing Breeder Queens to Beekeepers

We are focussed on selective breeding of honey bees that exhibit so-called hygienic behaviour whereby worker bees remove dead or infected larvae and pupae from their cells thereby reducing the spread of disease within a colony. Researchers in the US found that hygienic colonies may produce as much honey as other colonies, but are resistant to brood diseases such as American foul brood (AFB), European foul brood (EFB) and the fungal disease, chalk brood. Hygienic behaviour can also disrupt the breeding cycle of varroa slowing the population growth and reducing their levels.

Hygienic behaviour is a naturally occurring genetic trait, which can be selected for using conventional bee breeding methods. We do this by observing colonies known to exhibit hygienic behaviour and isolating the most hygienic workers. Molecular techniques are then used to determine the patriline (i.e. identity of the drone father of the worker). Daughter queens are then reared that have the same father as the hygienic workers. This 'intracolony' method of breeding for hygienic behaviour is more effective and rapid than breeding on a colony basis.

Although we identified several hygienic colonies in 2008–9 they became queenless over the 2009 winter and we needed to identify further colonies for observation during 2010. We also video-recorded the behaviour of individual worker bees presented with freeze-killed brood to obtain some insight into different components of hygienic behaviour. Throughout 2010 queens were reared from hygienic colonies; some were open-mated in our apiaries and others were instrumentally inseminated. This technique was carried out by Michael Collier from Shropshire, and we now have our own instrumental insemination apparatus thanks to a donation from the Somerset BKA. Tissue samples for DNA extraction from bees in the observation hive studies and from the reared queens are currently being analysed by Dr Annette Jensen at the University of Copenhagen, Denmark.

Because only a limited gene pool is available to us we have sought dark European honey bee (*Apis mellifera mellifera*) queens from beekeepers throughout Europe. During 2010 we obtained queens from the Island of Colonsay, Scotland, and from Galtee, Ireland. In 2011 we are promised queens from Læsø, Denmark and from West Cornwall. We intend to compare colonies headed by these queens with colonies headed by our queens, and we will include suitable queens in the breeding programme. We have also made contact with members of the Bee Improvement and Bee Breeders Association (BIBBA) and the Societas Internationalis Pro Conservatione Apis melliferae melliferae (SICAMM).

Norman Carreck has contributed to a major review on bee diversity in Europe as part of the COST-funded 'Prevention of honey bee COLony LOSSes' (COLOSS) network, which currently consists of 217 scientists, representing 55 countries worldwide. Gianluigi Bigio, with a degree in molecular biology from Italy and plant genetics experience in Ireland, and with a beekeeping background, joined the team in spring 2010 to study for a PhD funded by the BBKA. His goal is to look at techniques for improving the breeding and rearing of queens. In his first field season he has been comparing methods of maintaining virgin queens in cages.

We are now starting to test the queens we raised or purchased in 2010 for their hygienic behaviour. We will rear more queens from the best colonies using intracolony selection and will monitor varroa infestation in these colonies. We are mindful of the importance of having facilities available for queen rearing and for their distribution to beekeepers. The involvement and support of members of the Bee Farmers' Association will be essential to achieve this.

Francis Ratnieks, Norman Carreck, Karin Alton and Gianluigi Bigio, Sussex University

Improving Honey Bee Health with Food Supplements

An £80,000 study, which aims to improve the palatability of food supplements fed to honey bees, has been awarded annual 'seed-core' funding from the BBKA. This £17,600 grant has enabled Keele University to obtain more than £60,000 from the Perry Foundation, to award a four-year post-graduate scholarship to former student, Richard Bridgett. In May 2011, Richard started working with Dr Falko Drijfhout at Keele University and Dr David Aston, Chair of the BBKA's Technical and Environmental Committee, to study methods to enhance honey bee health by looking for substances in pollen that stimulate bees to feed.

The team will investigate which compounds are responsible for the palatability of pollen to the honey bee by studying compounds from various pollen sources, and will determine if they are common or specific to a plant species. These natural compounds can then either be isolated, or synthesised, and mixed with pollen substitutes to increase their palatability. Dr David Aston said: "Poor nutrition affects bees' resistance to disease. In certain parts of the world, it has been established that giving additional pollen to a honey bee colony, often in the form of pollen

patties, has improved its strength. It is believed that feeding stimulants — natural compounds within pollen itself — influences honey bee feeding behaviour."

Firstly, chemical analysis of pollen will be undertaken at Keele University to isolate and identify potential phago-stimulants, i.e. the chemical compounds which stimulate feeding. Active extracts will be analysed using gas or liquid chromatography coupled with mass spectroscopy, with the aim of identifying individual compounds that can then be tested as phago-stimulants in phase two. The second phase will be to use pilot bio-assays (i.e. experiments that are designed to measure the effects of a substance on a living organism) to test the activity of the extracts and individual compounds. This will be done using small numbers of bees, initially under controlled conditions, with the help of the honey bee laboratory at Sheffield University.

The results of these trials will then be used in phase three to create artificial diets to be tested within the UK by BBKA members feeding their colonies during early spring.

Choosing the correct protective clothing

Beekeeping is one of the fastest growing hobbies of recent years. This is not surprising because it is open to everyone from the very young to the most senior members of our society. But being properly equipped is key, and choosing the best protective clothing must be top of the list for all beekeepers. There are many suppliers to choose from and it can be tempting to buy a cheaper suit, although it may not last the distance. In this feature we describe some of the common types of suit and veil available.

Considerations to make when choosing a bee suit

A bee suit is not a fashion item. It is important that it is loose fitting because this creates an air gap, which will keep you cool and allow for you to wear clothing underneath without restricting your movement.

For the novice, wearing the right suit is essential to give you maximum confidence when handling your bees. **BBwear** have developed a complete range of full and half suits to cater for every need. We recommend new beekeepers wear a full suit because this offers head to toe protection. The **BB501** (shown right) is a full, economy suit made to the same high standard as the luxury **BB1** (shown below), but without the extra pockets and zips — and at an affordable price. When worn with the correct accessories **BBwear** suits offer some of the best protection around.



BB501



Left: BB1 full suit; Right: smock
Centre: Jacket

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Developing products by listening to and learning from customers has always been paramount

It is important to **BBwear** that we supply a product that our customers like and are happy to wear. Over the years we have listened to our customers and have developed new ideas based on their suggestions and requirements. This has included plenty of pockets, thumb loops, waterproof knee patches and ankle zips. We also supply free leather gloves with some of our suits.

If our suits are worn and used in the correct manner, they will last for many years. If, however, they should become worn or damaged we offer a full repair service.

Veils and hoods

The veil is the most important part of a suit and they come in two different styles: the fencing hood and the round hat type (shown above right). A veil should be robust, UV-resistant and allow excellent vision. All our hoods are interchangeable with all our suits and they hold their shape very well. **BBwear** use a veiling that is specially made for us, which has some of the best qualities around. We have been using this veiling for three years and have never had a faulty one yet!



The 'BB' fencing type hood



The RR round type hood

All hoods can be thrown back when not in use as illustrated by the **BB1**

full suit (shown right), and they are attached to the suit by open-ended zips. This means they can be removed easily for washing purposes. We are trying to source plastic boning for the round hoods, but all our hoods are washable — a quick hand wash and drip dry is usually adequate. The BB range hoods are also machine washable. To protect the the veil when in a washing machine it is a good idea to unzip it and place it inside the suit.



BB1 full suit

Suits for juniors

BBwear carry children's suits from age four to twelve in a range of colours and are keen to promote beekeeping among the younger generation. We support those beekeepers who are working with schools and colleges and some associations now have bespoke Bee Tents made by **BBwear** that are used for demonstration purposes at shows allowing children the opportunity to take a look into a working hive.

"We design products around our customers' needs"

BBwear has been manufacturing and supplying protective clothing for more than ten years. We pride ourselves on the quality of our products and the service we are able to offer. Our suits are made in the UK using only the best materials and components. We supply suits to many businesses and associations and endeavour to offer a fast competitive service. We also supply suits to most countries in Europe, North America and Australia.

Purchasing a **BBwear** suit will give you quality at an affordable price and a suit that will last for many years with the assurance that you will have excellent aftercare service should you need it.

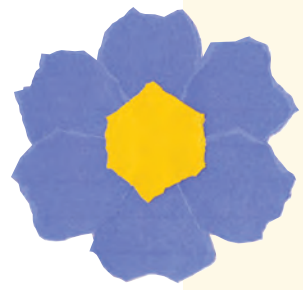
How you can contact us

If you have any questions please make contact with us via our website www.bbwear.com or email us at mike.bb1@btinternet.com

Come and meet us

We will be at the BBKA Spring Convention at Stoneleigh and the National Honey Show and would love to chat with you.

Beekeeping Notes For Beginners



July — and winter is approaching! Two main thoughts occupy the beekeeper's mind at this time of year — processing the honey crop and getting the bees ready for winter.

Depending on where you are in the UK, these activities take place at different times. This month we will concentrate on starting to process the honey crop. Extraction and bottling will come next time — I know you will be itching to sample your honey by now.

Last ideas on supering

Firstly, though, we need to complete the discussions about supering. Last month, I described how to add supers to the hive as income accumulates. The question that some of you will be asking now is: What do I do with the partially capped supers and how can I extract them? There are a number of points to be made here. Uncapped honey cannot be left on the hive; in all probability it will ferment due to its high water content. This will cause problems for the colony. If you have ever smelt fermented honey you will know it is not pleasant.

As the last stages of the nectar flow progress you can carry out some reorganisation of super frames on the same colony to put the capped frames in the upper supers and leave the uncapped frames nearer the brood. This may improve capping levels. Do not swap super frames between colonies.

One useful technique is not to try and produce more and more honey, but to produce wax. Towards the end of the flow, place a super with frames and foundation or, even better, a brood box with frames and foundation as your next super. The bees will start to draw out the cells but, if you time it right, the flow will finish before these cells start to fill with nectar. This will give you fresh, dry comb to use next year. If you added a brood box, you will have the start of clean frames for your comb change next spring; this is a good example of thinking ahead. We will talk about comb storage later. These points show the importance of being very aware of your local flora and nectar sources; you will need a few years' practice to get the timing 'just right'.

“ You can reorganise super frames by putting the capped frames into the upper supers, leaving the uncapped frames nearer the brood. But do not swap super frames between colonies. ”

For mathematicians:

The other technique for dealing with uncapped honey needs more care. When you extract and bottle honey, you are aiming to ensure that the water content does not exceed 20%, otherwise you are in breach of the Honey Regulations (and the honey will ferment). By using a refractometer (see photograph on the right), you can assess the water content of the capped honey and the uncapped honey. Make sure you use one calibrated for honey; there are many different types. If you also estimate the fraction of the capped and uncapped honey that you are about to extract, some arithmetic will allow you to work out the average water content of the total batch. Take care; if you get this wrong, there is no easy way to reduce the water content afterwards!

The other way is to feed the uncapped honey back to the bees, but first we need to understand a question of critical importance

to honey extraction and processing: What is the 'inside' of the hive?

This seems a strange question unrelated to extraction, but you have to look from the perspective of the bees. The honey bee community is 'held together' by queen substance (a chemical pheromone) and this is transmitted within the hive by grooming. The colony also has a general smell, which forms part of the mechanisms that stabilise the community.

These substances are contained in a volume that is bounded by the floor, the brood and super boxes and the crown board. From the point of view of the bee, this volume is *inside* and subject to the mechanisms that regulate the colony. Anything not inside this volume is *outside* and is a potential source of forage etc. Note that anything that we regard as being part of the hive but is above the crown board is regarded as being *outside* by the bees. If we keep this in mind we can understand three critical parts of honey processing: clearing, dealing with odd uncapped comb and dealing with 'wets', which we will discuss next time.

Clearing

There are many techniques for clearing bees from supers prior to extraction, but first:

Hygiene: Honey is food, not just because we eat it, but because the law of the land says so. Helping to maintain the public perception of honey as a pure, clean food is the responsibility of every beekeeper. When you contemplate removing a nice, full, capped super you need to undergo a subtle mind shift. This super is not now part of the hive, it is food that someone will eat; how will you keep it clean?

When processing supers prior to extraction, do not put them on the ground to pick up dirt; use a clean board or tray. Wrap supers in clean plastic sacks, not the dog blanket in the back of the car! Store supers somewhere bee-tight and clean; not the potting shed. I am sure you get the idea..., so back to clearing.



The refractometer kit: the refractometer (R, open), glass rods to apply sample (GRs), distilled or de-ionised water to clean after use (this prevents limestone build-up) and tissue paper. Photo by Chris Deaves.

- ❑ **Mechanical techniques:** Remove the super and shake the bees off each frame. You will need another empty super to store each cleared frame, and a cover to stop the bees coming back. You can remove the bees by simple shaking or brushing (do not use a goose quill as scales from the feather will finish up in the honey) or by blowing with a leaf blower, which is a common commercial practice, but not advisable for the beginner. Whichever method you use, be careful not to stir up the apiary and have bees from other hives come and rob the super. More about robbing next time.
- ❑ **'Smell' techniques:** You can use foul-smelling chemicals made for this purpose. A few drops on a pad placed on top of a super will make the bees move downwards quickly. Follow the instructions to the letter; you do not want tainted honey.

These two techniques have the advantage of being 'one-stop' i.e. if the colonies are in an out-apiary you only need one visit.

- ❑ **Using a clearer board:** This is the most common technique probably the least disruptive to the colony. Prepare a clearer board, which is a crown board fitted with either Porter bee escapes in the small oval holes or a diamond escape (sometimes called a 'Canadian' escape) fixed underneath the crown board; this sometimes confuses beekeepers.

If you are using the Porter escapes, make some simple checks; the top slides off. Now ask yourself the following questions:

- ❑ Are they fitted the right way up; usually the 'top' is labelled?
- ❑ Are they firmly fixed; use drawing pins?
- ❑ Are the two springs working? They corrode and break over time, especially if exposed to soda when the plastic body is cleaned.
- ❑ Are the end gaps between the spring pairs correct? Three millimetres is about right.
- ❑ Are there any dead bees gumming up the works?

The clearer board is placed underneath the super(s) you wish to clear and on top of the hive in place of the standard crown board. You can clear two supers (or one deep box) at a time, but no more.

What happens when a bee escape is fitted?

The common perception is that the escape acts as a one way valve and the bees gradually 'wander' through this into the main colony and cannot return. If this were true it would take a long time and not every bee would do this. Think back to the inside and outside. The bees above the crown board are now cut off from inside. After a short while, maybe half an hour, they realise they are outside and they run back through the escape to rejoin the colony. This is a real 'stampede'; if you lift the super after a while you can see it in progress. It is exactly like the process that you may have used to hive swarms; the bees run towards the queen and colony.

This stampede needs to be maintained for clearing to work well. When the bees pass downwards through the escape they have very few places to go; either into the bee space (for a top bee space hive) or down between the frames. This can result in congestion and slowing of clearing. It is a good idea to temporarily place an eke (which is a 'thin' super box about five centimetre high) under the clearer board — or even an empty super box — to create an extra space for the bees.

Finally, remember that a cleared super sitting on the hive is defenceless. If there is the slightest gap in the woodwork, including

“ Remember that a cleared super sitting on the hive is defenceless. If there is the slightest gap in the woodwork, including the roof, bees from other colonies will come and rob the super. This will happen overnight and all your and the bees efforts will be wasted. ”

the roof, bees from other colonies will come and rob the super. This will happen overnight and all your and the bees efforts will be wasted.

So, back to the first question: What about uncapped frames? The term outside also means 'forage'. From the point of view of the bees, nectar outside the hive must be brought inside and processed. Usually this applies to flowers as nectar sources, but any outside source will do. If you place uncapped frames above the crown board they will be regarded as forage sources and the uncapped honey will be brought down into the hive and stored in the corners of the brood chamber or in other partially full supers. To prevent transmission of disease, frames should only be fed back to the colony they came from. There are a number of techniques for this.

- ❑ You can lay the frame flat on the crown board; one or two may fit depending on the frame size and the hive type. If there are some sealed cells, score gently with a hive tool. Make sure you do not block the ventilation through the oval holes. Place the frame on some small twigs, wedges or even a small metal grill.
- ❑ If you have a lot of frames, place them in another super box above the crown board, but watch out for wax building.

Bees behaving badly — learning bad habits

Finally, there is a major consideration regarding encouraging robbing. All through the spring and summer, bees have associated nectar with flowers. By feeding back nectar in frames to a colony, bees will learn that other hives also are nectar sources. This tends to encourage colonies to rob others. To minimise this risk:

- ❑ Firstly, before you start clearing supers at the end of main flow, fit the entrance block back on the hives with a 'medium' gap (about 8–10 cm) if your block design has one, this will allow better defence of the colony against robbing.
- ❑ Secondly, defer 'feeding back' for as long as possible and ideally until all flower flows are finished — and ensure that by now you have the entrance block in, ideally with a small gap.

We will cover robbing and its prevention in more detail next time.

Chris Deaves,
Chair of Education and Husbandry Committee



Course in a Case

BBKA has approval for a formal Level 1 beekeeping qualification within the QCF (Qualifications and Credit Framework) — the new government framework which sets out how all regulated vocational qualifications are structured, titled and quality assured. The Beginners CiC (white) provides sufficient information for this course.

See page 24 for full information.

Pros and Cons of Late Summer/Early Autumn Requeening



Photo by Christine Knott

Like many new beekeepers my first colony was a prime swarm given to me by a member of my local association shortly after completing an introductory course in beekeeping. Not knowing at that time the age, characteristics or origin of the queen, I decided to replace her. True to form, the more experienced beekeepers I asked gave me a range of answers on when was the best time to do this. Preferring not to rely on supersedure and the risks associated with it, I introduced a new queen of known origin as soon as I was able.

Colonies that are headed by healthy, young, productive queens are essential to successful beekeeping and routine requeening is an important part of honey bee management. A new queen can be introduced into a colony at any time during the active season. However, by using compensatory measures (opposite) as needed, it is generally recommended to routinely requeen in late summer or early autumn, leaving enough time for the new queen to become well-established before the start of winter.

Factors supporting successful requeening	Compensatory measures that can be taken by beekeepers
There is a nectar flow.	Feed the colony sugar syrup (50% white sugar 50% water).
Younger bees (as they are less likely to pose a threat than older workers and therefore accept a new queen more readily).	Introduce a new queen to a nucleus with younger bees before uniting.
Smaller colonies (as they tend to accept a newly introduced queen more readily than larger ones).	
Colonies are not robbing the stores of others (as those which are being robbed can become defensive and aggressive and consequently less likely to accept a newly introduced queen).	■ Ensure there are no cracks or crevices for the robbers to use to enter the hive. ■ Reduce entrance to one or two bee widths so that it can be more easily defended. ■ Be careful not to spill any honey or sugar syrup in the apiary. ■ If necessary move the newly requeened colony, or the robbers, to a new site.
Replacing like with like.	Replace a laying queen with another laying queen.

Pros of late summer/early autumn requeening

- **Greater chance of winter survival**
- A young queen introduced in late summer continues to lay later into autumn than an older queen, taking a higher percentage of young, healthy bees into winter.
- A young queen is more likely to survive the winter than an older one.
- **Faster spring build up**
- A young queen, introduced in late summer, starts laying earlier the following spring and is less likely to be superseded or to swarm.
- Colonies requeened in late summer are generally larger the following year than those headed by older queens.
- **Better availability of young queens**
- If purchasing queens they can be bought more cheaply at this time of year and locally bred ones are more readily available.
- **Pests and diseases**
- A break in the brood cycle at this time of year can reduce disease and disrupt the growth of parasitic mites (e.g. populations of acarine can increase dramatically in the autumn).
- **Acceptance**
- Summer ends when the bees decide that they can dispense with the drones. With no drones about they seem to be aware that they have no alternative but to accept the new queen when they realise they have lost their own. Acceptance rates are higher at this time.
- If the new queen is not accepted, then there may be time to try again before the start of the cold weather.

Cons of late summer/early autumn requeening

- **Hives more populous**
- Colonies are larger making it more difficult to find the old queen.
- A higher population of bees makes it more difficult to spot capped queen cells, and a virgin queen may be present in the hive or out on a mating flight.
- **Lack of honey flow**
- If the older bees are not occupied by a nectar flow there is a greater likelihood they will be more defensive and prone to robbing (attracted to the easiest source of food), and the chances of acceptance are reduced.
- To compensate for lack of honey flow all colonies in the apiary will have to be fed to lower the risk of stronger colonies robbing the requeened one.
- If robbing has already commenced in the apiary the beekeeper will have to take measures to stop it before he can requeen.
- **Risks of failure**
- The chances of acceptance are lowered if the current queen is in full lay.
- If the new queen proves to be of inferior quality, then there may not be time to try again before the start of the cold weather and consequently there will be a lower population of winter bees.

Whenever you choose to requeen, it is better, and much more fun, to raise your own queens and it will make your beekeeping even more interesting.

Richard McRae
Lancashire BKA

Branding Hives

This year has seen a few thefts of bee hives, and branding hive components is one method to dissuade theft and to identify the legal owner should a stolen hive be recovered by authorities or fellow honest beekeepers. It is a fairly easy process if it is practised beforehand.

Some users of fire brands have been using a propane flame or even cooker rings to heat their brands. This is not recommended as this often does not produce the even amount of heat required to effectively scorch and indent the surface. The tool must be at what is called a 'black heat' to achieve a single application of a brand. This is obtained by heating the brand until it can just be seen to be red hot. The brand should be held in a shaded place i.e. a cardboard box laid on its side, and then watched until any redness has disappeared. This should then be hot enough to scorch and indent but not cause spontaneous combustion of the wood. The brand should only be applied once and for the right duration. Practise on waste wood before trying it on the hives is essential. If the iron is applied more than once to deepen an unsatisfactory first burn, often it will not always register in the same place producing an untidy double image.

The best heat for the brand will be in a small controlled wood fire made from off-cuts of dry timber cut into small sticks. This can be built near to your hives. This should be in a ring of eight or nine house bricks to control the fire with a metal rod pushed into the

ground to hold the handle up while the brand is resting flat on red hot embers. The iron



Photo by David Salt

should be heated after a good red hot heart of glowing cinders has been obtained. Make sure you have plenty of fuel if branding many hives.

The type of wood will also affect the quality of the brand image. Softer woods such as cedar and pine will scorch much quicker (4 to 5 seconds) than harder woods such as oak, which will require a much longer application. It is strongly recommended that a practise on any off cuts of similar wood (pine) is tried in order to estimate the heat of the brand and time needed to scorch and indent your hive.

Following the 'burn' it will be seen that a halo of 'toasted' wood will be seen around the brand letters/numbers. This has been caused by radiant heat from the back plate. This can be removed and the overall brand appearance improved by gently sanding with the grain using medium sand paper over a sanding block.

I hope this helps those of you who have purchased brands. We hope to have a video on YouTube in the next few weeks to demonstrate the above.

David Salt, Blacksmith, enquiries@wyvernforge.co.uk



Photo by Simon King



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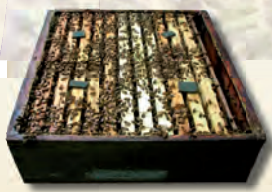
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Honey Bee Anatomy:

Focus on foraging apparatus

When collecting nectar (or water) the honey bee uses its proboscis to suck up the liquid into its mouth and from there into the crop, or honey stomach where it is carried back to the hive. The proboscis is used like a drinking straw to reach the nectaries of the flower. These are often at the base of the petals in a restricted space which the bee could not reach without the aid of its long thin proboscis. Although the bee uses its proboscis like a drinking straw it's structure is not, in fact, a hollow tube. It is made up of several individual elements, which the bee is able to bring together to form a tube when it needs to. As can be seen in Figure 1, there are five main components to the proboscis: two galeae, two labial palps and the glossa. The galeae and labial palps are brought together to form a tube when the bee is collecting liquid. The glossa is a hollow elastic rod, which runs down the centre of the proboscis and can be thought of as the bee's tongue. It is covered with hairs and can be extended and retracted allowing it to reach beyond the end of the proboscis.

When not in use, the proboscis is folded away along the underside of the head. On arrival at a flower, the bee swings the proboscis forward and holds it in place using the mandibles (Figure 2). The upper lip, the labrum, in the form of a soft pad, seals round the proboscis and ensures an airtight seal between it



Figure 2. Head of a worker, showing the proboscis swung forward and held in position by the mandibles.

the cavity causing a partial vacuum, which draws liquids up the proboscis and into the mouth.

Granulated honey has to be dealt with differently. The crystals have to be dissolved and then the resulting solution can be gathered using the proboscis. The bee uses saliva, produced in the post-cerebral and thoracic glands, to help with this. Saliva is allowed to run down the hollow glossa onto the crystals of sugar and then a hard, rough pad at the tip of the glossa, the flabellum, is used to scrub the saliva into the crystals to dissolve them.

In addition to nectar, bees also forage for pollen. This provides them with protein, vitamins and minerals and is essential to the survival of the colony. Honey bees are hairy insects and one function of the hairs is to attract and collect pollen as the bee clammers over the anthers



Figure 3. Plumose hairs from a worker.

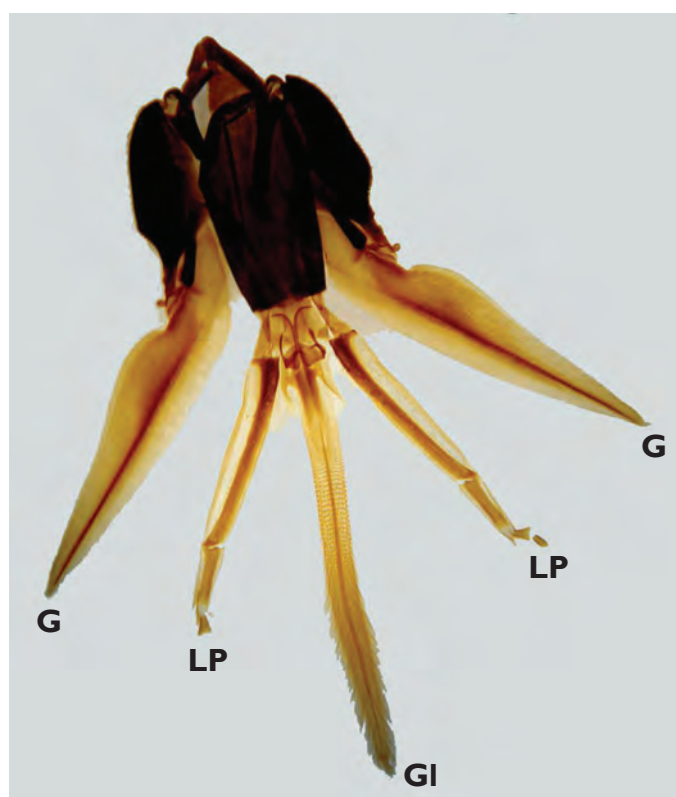


Figure 1. Proboscis showing from left to right: galea (G), labial palp (LP), glossa (GI), labial palp (LP) and galea (G).

and the mouth cavity. The glossa is used to lap up liquid, which is held in place by the hairs covering the end of the glossa. The glossa is then retracted into the proboscis and the bee uses muscles in the wall of the mouth cavity, the cibarium, to expand



Figure 4. Hind leg of a worker showing the pollen basket fringed with hairs.

of a flower. The hairs are branched or 'plumose' (Figure 3) and this assists with the collection of pollen.

Workers carry pollen back to the hive on their hind legs in what is known as the 'corbiculum' or 'pollen basket'. Each of the bee's legs has six segments: the coxa, trochanter, femur, tibia, tarsus



Figure 5. Inside surface of the hind leg showing the combs on the basitarsus and the pollen press with its rastellum.

and pre-tarsus. The tibia on the hind leg has a broad, concave area, the corbiculum, which is surrounded with a fringe of hairs to help hold the pollen load in place (Figure 4). The tarsus on each leg is further divided into five sub-segments the first of which, the basitarsus, is much larger than the others and has a significant role in the collection of pollen.

Each basitarsus is covered on its inner surface with hairs, which act as combs (Figure 5). Those on the hind legs are arranged in nine rows. The interesting question though is: how do the bees transfer pollen from the hairs covering their body into the corbiculum on the hind leg?

If you watch a honey bee while it is foraging for pollen you may see it take off from a flower and then hover while grooming itself with its legs. The forelegs groom the head, the middle legs the thorax and the hind legs the abdomen. The forelegs are moistened with nectar, which helps to stick the pollen grains together. There is an area on top of the thorax, which the bee cannot groom as anyone who has bees that visit Himalayan Balsam will be aware of. Bees working Himalayan Balsam return to the hive with a white patch of pollen on the top of the thorax — an area the bee cannot reach. Pollen is passed from the forelegs to the basitarsus of the middle legs and from there to the hind legs. The bee then rubs its hind legs together, which causes the pollen to be transferred into the joint between the basitarsus and tibia.



Figure 6. The pollen load — this is carried on the corbiculum to the hive. All photos are by Graham Royle.

This joint is known as the 'pollen press' (Figure 5) and is equipped with a row of stiff spines, the rastellum, which scrapes pollen from the basitarsus of the opposite leg into the pollen press. The joint is then flexed to force pollen out of the joint onto the outer surface of the tibia and into the corbiculum. This process is repeated, gradually building up a full pollen load (Figure 6) before the bee returns to the hive.

Further Reading:

1. Dade HA. *Anatomy and Dissection of the Honeybee*, 1994, IBRA, Cardiff.
2. Goodman L. *Form and Function in the Honey Bee*, 2003, IBRA, Cardiff.
3. Snodgrass RE. *Anatomy of the Honey Bee*, 1956, Cornell University Press, London.

Graham Royle, NDB

Does Size Matter?

In the previous article we discussed how a superorganism can match and even out-perform a larger, multicellular organism. In this article our attention turns to hive and frame sizes. Is big better here? Over the years beekeepers have developed all manner of containers (hives) to accommodate their bees, but it was not until 1851 that Rev. Lorenzo Lorraine Langstroth (25 December 1810 – 6 October 1895) discovered the concept of a bee space.

What is Bee Space?

In 1851 a native of Philadelphia, the Reverend Lorenzo Lorraine Langstroth (1810–1895), discovered that if a space of 1 cm (3/8 inch) is left in the hive for the bees to move around in, the bees will neither build comb in the space nor cement it shut with propolis. *This he called 'bee space'.* Over the summer of 1851 he extended the concept to keeping the lid free on a top-bar hive, but later he realised that the discovery could be applied to a newly designed frame that would prevent the bees from attaching comb to the inside of the hive box. *Today the bee space is considered to be between 6 and 9 mm (1/4 and 3/8 inch).*

With the newly-realised importance of bee space Rev Langstroth opened the door for the development of modern, movable, frame box hives. Another famous apiarist, Jan Dzierzon, (see Box 1) had earlier made several important discoveries, one of which is relevant to our story: there are five worker cells but only four drone cells in every linear inch on a comb.

Before we proceed it must be said that there is variation in cell size and foundation sizes have been manipulated to suit an individual beekeeper's aims.

Cell size

Natural worker comb has cells that are 4.6–5.5 mm across with an average of 4.8–4.9 mm across. In the UK commercially made foundation is around 5.45 mm across but in the US smaller commercially made foundation of 5.3 mm is used. In the US, small cell foundation, which is used for varroa control, has cells that are 4.9 mm wide while it is the standard foundation cells that are 5.3 mm wide. But what we now call 'small cell' was actually the natural cell size back in the early 1900s.

In the early 1900s most foundation used was of the 'small' variety but bee breeders thought they could improve things by growing bigger bees that would produce more honey. They created these by manufacturing foundation with larger cells. Sure enough, in not too many generations, the bee larvae filled the cells and the resulting adult bees were bigger. We are still using these 'big bees' today. However, bigger bees use more food and, in any case, unless you renew your foundation regularly the cells get small and so do the bees. This is because the pupal skins left in the cell after the young bee emerges will slowly reduce the cell dimension; another good reason for comb change! In 1995 some scientists noticed that Africanized bees, which are slightly smaller than European bees, had lower mite counts, and they formulated the idea that the natural (smaller) cell size might impede the growth of varroa mites. This idea was supported by earlier research that showed that when immature male mites are squeezed between the bee pupae and the

Box 1

Jan Dzierzon (opposite), the Father of Polish Beekeeping was born on 16 January, 1811 in Lowkowit near Kreuzburg on his parents' small farm. He graduated from university in Theology and was ordained as a Roman Catholic priest. He had a small parish of around 70 and so had enough time to conduct research on the life of the bees. He died on 26 October 1906.



His discoveries include:

- ♦ Parthenogenesis i.e. drones develop from unfertilised eggs.
- ♦ Noting the development times for each sex and cast.
- ♦ The observation that queens mate outside the hive.
- ♦ Identifying how wax is secreted and comb constructed.
- ♦ Giving a description of swarming.
- ♦ Showing that bees accumulate fat and protein in their bodies.
- ♦ Proving that seeds and fruit pollinated by bees are more numerous and more perfectly shaped.
- ♦ Showing that honey dew could be of plant, fungal or animal origin.

Photograph was obtained from Wikipedia and made available under the Creative Commons Attribution-ShareAlike Licence.

cell walls, they often die. Some consider that smaller cells help by offering a smaller gap for the female mite to access the cell before it is capped. With this in mind, beekeepers started regressing their colonies. That is, they tried to do the opposite of what the beekeepers in the early 1900s did; they provided smaller foundation in the hope that male mites would get squeezed to death in the tight confines of the smaller cells. But, just as bees on large foundation grow bigger, bees on small foundation become smaller. And so the *status quo* is restored and the view now is that smaller cell foundation is ineffective in controlling varroa. For our purposes we will consider that on average there are five worker cells per inch or 25 per square inch.

Back to the story. If bigger bees do not collect more honey will bigger frames and/or hives improve our honey crop? If you look at Table 1 you will see the dimensions of the common brood boxes in use and number of cells that each will hold, but it is not that simple! If every cell was available to the queen then life would be simple but some are used to store nectar or honey; especially if you do not add supers quickly enough. In addition they become pollen clogged, or are damaged along bottom bars and have holes to give shortcuts between frames. Other cells get converted to queen cups, and some just get drawn out badly. So if you replace your comb regularly I would estimate that 10% of cells are unusable. In addition, the normal arched, brood pattern with pollen and honey above the brood means that the top and corners of each frame are rarely used. Taking all this into account I would estimate that only 80% of the brood area is available to the queen for laying but only when there is plenty of room for the storage of honey in the supers above. So, when you examine the last two columns in Table 1 you can see the estimated usable brood area and the brood area of each compared with the commonly used National hive. The WBC, having only ten frames, has a decrease in brood area to 91% of a National's but the largest hives, the Langstroth and Dadant, have 124% and 171% respectively. So does this matter?

Table I. Comparison of different brood box sizes used in the UK

Hive type and dimensions	Approx. Vol. ¹	Bee space	No. brood frames ²	Length of frame lugs	Brood frame size	Comb area ³	Total comb area	Max No. brood cells ⁴	Likely No laying cells ⁵	% of National ⁶
National 18 1/8" x 18 1/8" 460 mm x 460 mm	36	Bottom	11	Long	14" x 8 1/2" 356 mm x 216 mm	199 sq. in	2189	54725	43780	100%
Deep National (14 by 12) 18 1/8" x 18 1/8" 460 mm x 460 mm	51	Bottom	11	Long	14" x 12" 356 mm x 305 mm	292 sq.in	3212	80300	64240	147%
WBC 19 7/8" x 19 7/8" 505 mm x 505 mm	32	Bottom	10	Long	14" x 8 1/2" 356 mm x 216 mm	199 sq. in	1990	49750	39800	91%
Dartington 36 1/4" x 18 1/8" 920 mm x 460 mm	124	Bottom	11 Half the box!	Long	14" x 12" 356 mm x 305 mm	292 sq. in	3212	80300	64240	147%
Commercial 18 5/16" x 18 5/16" 465 mm x 465 mm	48	Bottom	11	Short	16" x 10" 407 mm x 254 mm	275 sq. in	3025	75625	60500	138%
Langstroth 20" x 16 1/4" 508 mm x 413 mm	44	Top	10	Short	17 5/8" x 9 1/2" 448 mm x 241 mm	272 sq. in	2720	68000	54400	124%
Smith 16 3/8" x 18 1/4" 416 mm x 463 mm	36	Top	11	Short	14" x 8 1/2" 356 mm x 216 mm	199 sq. in	2189	54725	43780	100%
Dadant 20" x 18 1/2" 508 mm x 470 mm	59	Top	11	Short	17 5/8" x 11 1/4" 448 mm x 286 mm	340 sq. in	3740	93500	74800	171%

Key:

1 = Approximate volume of brood box in litres; 2 = Number of brood frames; 3 = Brood comb area on each frame (both sides); 4 = Maximum number of brood cells (Equal to Total comb area on all frames X 25 cells/square inch); 5 = Likely number of cells available for the queen to use (assumed 80% availability — see text for explanation); 6 = The percentage of useable brood area compared with that in a National box, which is given 100% value; for a Deep National, therefore, the calculation is: 64240 – 43780 / 43780 X 100 = 147%.

To answer the above question you must consider several factors including:

- ❑ **The strain of your bee.** A bee with Italian (*Apis mellifera lingustica*) parentage will need a bigger box as they notoriously convert a flow into more bees. Our dark European bee (*Apis mellifera mellifera*) is more frugal and restricts brood rearing.
- ❑ **The weather and your climatic area.** The more northern counties will have a shorter period of forage and so brood expansion will be less.
- ❑ **Your management regime.** Do you actively monitor brood expansion and egg laying room so that supers can be added or brood frames removed to make up nucs, etc? Are you averse to running a double brood box? What happens if the brood box is too small for your queen?

The most salient point is the consequence of a congested brood area but as usual there are two sides to this 'coin'. Firstly, if the queen runs out of laying space the colony will be likely to swarm and conversely a quest for laying space will tend to push stores into the supers. This year I would expect many of you will have had your fill of swarms by now! How then does a lack of space start some colonies going down the swarming route? ER Bent in his book *Swarm Control Survey*² categorises the swarm stimuli into three broad areas: external stimuli, the state of the bees, and the state of the hive.

These categories are broad but looking at our list above we can see which would be his external stimuli while the other two are not so clear cut but can be linked to space. So how does space or lack of it affect swarming? Dr C Butler³ discovered queen substance, 9-oxodec-trans-2-enoic acid (9 ODA), which inhibits the production of queen cells together with other colony functions. Now 9 ODA is passed from bee to bee during trophallaxis — or food sharing — so when you see the retinue of bees around the queen licking and cleaning her, 9 ODA is being transferred to them and in turn to all the bees in her colony through this food sharing route. This explains why the noise of a colony changes within minutes of you removing a queen. In addition, while walking across the comb's surface the queen spreads 9 ODA and her foot-print pheromone, which also inhibits queen cell formation.

This leads to the idea that if a brood box gets crowded then the amount of 9 ODA moving throughout the colony will fall and will not inhibit the production of queen cells and so swarming will start. Of course an old or failing queen may also fail to produce enough chemical and research has shown that if a new queen secretes a '100%' level of 9 ODA then a second season queen will only produce 60% and a third season queen 25%. From the foregoing, providing a bigger box should reduce congestion and so reduce swarming (but might it exacerbate the situation by diluting

Trophallaxis

This is the transfer of food or other fluids among members of a community via mouth-to-mouth (stomodaeal) or anus-to-mouth (proctodaeal). It is most highly developed in social insects such as ants, termites, wasps and bees and serves as a means of communication. It plays a role in spreading both the colony odour that identifies members and pheromones that regulate colony members' behaviour. In termites and cockroaches, proctodaeal trophallaxis is crucial for replacing the gut endosymbionts that are lost after every moult; these are the microbes that digest the cellulose in their diet.

Box 2

A queen in the height of the summer can lay up to 2,000 eggs a day but I feel a more realistic value for the average queen will be in the 1,500 – 1,800 range. Once laid an egg will occupy a cell for 21 days before a worker bee emerges. So the total number of cells needed for the queen to have unrestricted laying will be:

$$21 \times 1,800 = 37,800$$

But in addition, there will be cells used for:

Drones	500
Honey stores	10,000
Pollen	8,000
Total cells used per 21 day cycle =	56,300

the queen's chemicals?). However, Simpson investigated the size of the brood box and found, contrary to expectations, that bees in a smaller box were no more likely to swarm as long as there was sufficient space above the excluder within the super⁴.

We have considered lots of facts but where do we go? If you consult Box 2 you can see that a reasonable queen will lay enough eggs to occupy around 38,000 cells with brood (worker and drone) and that the colony will need fewer than 57,000 cells in total. From Table 1, you can see that a National box only has a maximum of about 55,000 cells, but more likely 44,000 with cell damage etc. A Commercial or National deep hive is about the right size! Out of the two the latter has long lugs and so is more beekeeper friendly unless you have petite fingers! A WBC is too small and the others have more space than is needed so that more honey will be packed into the brood box, which will therefore be heavier to lift.

What other evidence is there? Thomas Seeley looked at swarms and the size of cavity they select for their new home and came to the opinion that a cavity with a living room of forty litres is ideal⁵, which falls somewhere between the National and Commercial hive sizes.

Where do I sit? My view is that for most beekeepers keeping native bees (or our native mongrel) a National hive is suitable in most seasons in most areas of the UK but you must add your supers early and make sure you have good brood combs. This ensures there is the maximum number of cells available to the queen. Of course if you live in the balmy south or use prolific Italian bees then a larger box may be needed. Conversely those in the north keeping native dark bees will find the National suitable, and even a WBC! The conclusion is that box size is a complex issue and I have tried to outline some key issues using approximate calculations but the message is clear; pick your hive and adjust your management to make it work for you! In the final part of this mini-series I will consider more beekeeping equipment and sizes.

Bob Gilbert BSc. Master Beekeeper, Warwickshire BKA

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Gentle Beekeeping

We often hear beekeepers talking about the desirability of docile bees. I wonder, if the bees could talk would they discuss the desirability of gentle handling? After watching many beekeepers it seems evident that rough handling makes bees more defensive. In this article I will describe handling methods which I have found helpful; some of them unorthodox but they work for me and will be helpful for members keeping a small number of National hives.

Starting with the entrance; from spring to autumn I keep the entrance block in place so the bees are limited to a gap three to four inches wide and less than half an inch high. This entrance is easily defended by a few guard bees on a low level of alert.



An entrance block in place limits movement to and from the hive to a gap three to four inches wide by less than half an inch high. Photo by David Wootton.

However, if there is a flow on and the entrance gets crowded I sometimes pull one end of the entrance block forward a couple of inches; I would rather have quiet bees and a little less honey. Over the winter, ventilation is important so the entrance block comes out when the mouse guard goes on. Thomas Seeley has shown that, given a choice, bees choose a small entrance so his observations are consistent with mine, though his notes cover a wider range of sizes than I use.

On starting an inspection it is customary to puff smoke into the entrance, 'to let the bees know that I am coming in'. Surely this is not what we want; if it were possible to inspect without the bees knowing it would be ideal. It may be that smoke masks the smell of the alarm pheromone, but I often omit this initial smoking, especially early in the season, when the colony is small.

We all agree, I hope, that we then remove the roof and put it upside down to one side of the hive on the ground or, better, on a spare hive stand. Occasionally I find it convenient to block the entrance at this point so that retuning foragers gather outside instead of reinforcing the defenders inside. I then loosen the crown board leaving it in place on the top super. The aim at this point is to get the supers off so that the brood combs can be checked while the foragers are out.

If they are at all short of space bees build comb in the bee space between the top of the frames and the bottom of the frames in the next super. Generally, I deal with this by inserting the hive tool and using a wooden 'wedge' to hold the gap open while I puff a little smoke in; the hive tool is then run along the gap and used to push down the lugs of frames which are attached to the frame above. That works well if there is only a little burr comb, it takes too long if there is much. In this case I go along the top bars of the frames with a j-type hive tool lifting one lug on each frame by about half an inch to break the surplus comb; then with the attachments

broken the super is easy to lift. Do each frame quickly so that there is no time for bees to get into the new gap and get squashed.

Lift each super in turn, covered by the crown board, and stack them up on the roof. If there is much brace comb on the top bars then I lift the super off the hive before scraping most of it off so that odd bits of wax fall into the roof rather than into the hive and the bees in the brood area are not disturbed. Leaving the brace comb in place is likely to result in squashed bees.

I have seen people stacking supers with the lowest one in the roof, in this case it is likely that propolis will be transferred to the battens inside the roof; when next you lift the roof off it may lift the crown board resulting in an unexpected rush of bees or the crown board clattering back down.

This brings us to the queen excluder. If this is not framed it will be in contact with the frames, and so stuck down by the bees who will be justified in resenting the disturbance caused as you peel it off, so all queen excluders should be framed with the vertical spacing to suit the hive. But there is more to this. National hives are made from timber of thickness $\frac{3}{4}$ inch. On the two sides that support the frame lugs the thickness is reduced to half inch, so if the frame of the excluder is more than half inch wide it will be close to the lugs and is likely to be propolised in place by bees who are not planning to give easy access. The result again is noise and disturbance when the excluder is prised off and squashed bees when it is replaced. At

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Choose a framed queen excluder (shown). An unframed queen excluder will often be stuck down to the brood box by the bees; it will need to be prised off using a J-type hive tool. Photo by David Wootton.

present some manufacturers seem keen on producing excluders from sheet materials with no frame; it is not difficult to put a frame on these provided you have access to suitable machinery.

Early in my initiation into beekeeping I was taught that if bees in the hive look up to the sky because the hive has been opened and see movement, they assume that the movements are those of a robber who must be seen off. To avoid that reaction I keep my hands out of their field of view.

A short digression is needed here. In the UK we are fortunate that the hives most often used have a square cross section and so can be used with the frames either parallel to the entrance block, the 'warm way', or perpendicular to it, the 'cold way'. The bees do not seem to mind, but I do because with the frames 'warm way' I can stand behind the hive, well away from the entrance and I am free to turn to my left or right to get the light shining into the cells to help me inspect the brood. End of digression, back to the inspection.

Except during the winter I use a dummy board at the back of the hive, this comes out first and I often place it horizontally over the frames furthest away from me, so that the bees on that half of the hive are in the dark. Being right-handed I use the hive tool in that hand as a lever to gently separate the first frame from its neighbour. Keeping the tool in my right hand I use my left hand to release the left side of the frame. Resist the temptation to pass the tool to your left hand — it is likely that the movement will be seen as aggressive.

Lift out the first frame, if there are many bees on it then it should go into an empty box, a nuc is fine, a cardboard box will do if any internal flaps are taped down. The next frame out may go into the box too with a cover cloth to keep them in the dark while I use the generous working space to check the other frames. Using the hive tool to gently lever the next frame into the gap loosens the left side of the frame.

How many frames should be checked? Early in the season I look at the outer frames, which were put there in the last season because they are old enough to be due for replacement. My frames have a date on the top bar showing when the foundation was fitted and I look at the middle frames to check that all is well. Later in the year I sometimes look all through, other times just at three or four from the centre. If I see no queen cells there then it is unlikely that there will be swarm cells elsewhere.

From time-to-time drift a little smoke across the top bars and

listen to the bees; if their temper changes you need to decide whether you will close up or put on gloves and continue.

Do not waste time looking for the queen, just look for eggs to show that she has been there recently. After checking the frames replace the good ones and use your hive tool to lever them up tightly together. Replace the queen excluder and the rest of the hive.

Gloves; well I have come round to agreeing that new beekeepers should be allowed to use gloves, but not the heavy leather ones. New beekeepers are getting an insight into a new area and this is better if not associated with anxiety about stings. I do believe that their tutors should have gloves in the tool box but not normally on their hands. With experience confidence will grow and the greater ease of manipulation with bare hands will make the exercise more enjoyable for you and tolerable for the bees.



If you cannot see the queen, but can see eggs you will know that she has been laying recently and need not worry. If you can see uncapped larvae (shown) you will know the queen was present eight or nine days ago. Photo by David Wootton.

Brian Gant, Devon BKA

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Learning from Other Associations: Cumbria Beekeepers' Association Disease Day

How do you know if you have European foul brood (EFB), or nosema or any one of the other pernicious diseases that affect bees? For most people the answer would need to be 'ask a Bee Inspector' simply because we do not meet these diseases very often, and probably would not recognise them if we did. Of course for some of these diseases you do need to notify the bee inspectors if you think you may have them. And that is exactly what Cumbria Beekeepers' Association did last summer. We asked the bee inspectors — and what we ended up with was one of the best training days we could have had.

Cumbria Association covers a wide geographic region in the very north of England, and also borders Scotland and Northumberland. We have many members from north of the border, and some who have hives both in both England and Scotland. Cumbria itself operates as a number of local associations, all of which have fairly active training and apiary days. The Disease Day was organised by Peter Matthews, Cumbria Beekeepers' Association, on behalf of Ian Molyneux, Fera, and was hosted by Carlisle Branch at Houghton Village Hall.

The day started with a talk by Steve Sunderland, Chief Bee Inspector for Scottish Government Rural Payments and Inspections Department, ably assisted by Angus McAskill, Scottish Government Bee Inspector, and was about the 2009 outbreak of EFB and American foul brood (AFB). This talk explained the problems of inspecting some 2,500 colonies in 235 apiaries spread over most of Scotland, including the Highlands. The size and distribution of this major outbreak of EFB and AFB was attributed to colonies being sold and moved, and to the large number of colonies that are seasonally moved to heather moors.



We were then treated to a very informative talk by Ian Molyneux, Regional Bee Inspector from Fera, on how EFB and AFB affect bees, and how we can avoid our bees contracting these diseases. Other talks included an update on varroa, with practical demonstrations of how to check and treat this never-ending problem, and excellent talks on *Nosema cerana* and other diseases.



In the afternoon we split into groups for a series of practical workshops. The workshops, led by bee inspectors from both the Scottish and English inspection services and Graeme Sharpe from the Scottish Agricultural College, covered a wide range of topics. The hive inspection workshop was carried out in a field at the edge of the village, which had been well supplied with full active hives. This part of the day certainly caused some interest among the local population — you just have to try

and imagine the effect of over one hundred people walking around a small village in bee suits.

The indoor workshops included a chance to actually get your hands on some EFB and AFB. Yes that is right, we had infected frames to examine and test. One of the great advantages in working with the bee inspectors is that we were allowed, with suitable biological safety controls in place, to see and handle infected frames. Most people probably found this a little scary at first, after all we are trying to avoid these diseases, but with the correct procedures this can be safe.

The day was a huge success with nearly one hundred beekeepers, two Scottish bee inspectors, and five English bee inspectors all sharing their ideas and knowledge. Everybody learnt something and the overwhelming comment from everyone there was 'we should do it again'. So perhaps you should be contacting your local Regional Bee Inspector to organise something similar for 2012.

Nigel Vear, Cumbria Beekeepers' Association

BBKA Written Examinations

Successful Candidates in March 2011

Module 1 — Honey Bee Management

Brenda Allan, Whitbourne, Worcestershire
 Gillian Atkins, Bishops Waltham, Hampshire.
 Michael Barrie, Whitchurch, Hampshire C
 Lea Bayly, Milton Combe, Devon
 Evelyn Birt, Little Witley, Worcestershire C
 David Blower, Kenilworth, Warwickshire D
 David Corney-Walker, Newton Abbot, Devon C
 Robert Curtis, Loddon, Norwich, Norfolk C
 Adam Darling, Browston, Great Yarmouth, Norfolk
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 Clare Densley, Newton Abbot, Devon C
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 Anthony Edwards, Blackmore, Essex
 Alexander Ellis, Whitchurch, Shropshire D
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 Bridget Bowen, Dorchester, Dorset C
 Deborah Campbell, Gerrards Cross, Bucks
 Julie Coleman, Denstroude, Canterbury, Kent C
 Jane Corcoran, Wooburn Green, Bucks
 William Corr, Axminster, Devon
 Adrian Davis, Deal, Kent D
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 Marlise Zannetti, Godalming, Surrey

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 Julian Audsley, Ashley, Dover, Kent C
 Gillian Brewer, Bedford, D
 Deborah Campbell, Gerrards Cross, Bucks
 Rebecca Champion, Etchingam, East Sussex
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 Mary Walter, Leominster, Herefordshire D
 John Wilby, Lane End, Dartford, Kent
 Neil Wilmore, Redmile, Leyburn, Nth Yorkshire D
 Marlise Zannetti, Godalming, Surrey C

Module 6 — Honey Bee Behaviour

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 Peter Callan, Newton Hall, Durham C
 William Clayton, London, N1 C
 Andrew Cooper, Gateforth, North Yorkshire
 John Dadsell, Wendover, Buckinghamshire
 Brian Downes, Kingsdown, Corsham, Wiltshire

Note: C = Credit; D = Distinction

Notes from a Cliff Top Apiary

There was always something missing from the story of the feeding of the five thousand. I realised what it was recently. We have an excellent bread shop in the village, and on the slipway to the shingle beach there is a similarly excellent wet fish shop. (You are ahead of me at this point, but bear with.) So it's not uncommon some days to find myself down the village main street garnering both loaves and fishes. Now bread and fish are all very well as good and worthy stomach fillers, but what did they do, the five thousand, when that craving for something sweet spread across their taste buds? I can buy myself a chocolate bar but what was there on the banks of Galilee to give a sugar-shot to the bloodstream? Where was he, the man with dessert in the desert, the beekeeper with his basket of dripping honeycombs, ready to have them blessed and divided up for some massed fingerlickin'? Imagine how that would have gone down. Think of the applause. And what a recruitment gesture for beekeeping. But it didn't happen. That will always be the simplest two-course mega-feed in history, worthy, bland and good for the soul. A sound stomach filler in the search for the meaning of life.

For me, the search for the meaning of life is very largely satisfied in the discovery of a really good marmalade. Closely followed by maple syrup. Then honey. Sorry. That sounds like a sacrilege in this newsletter, but there it is. Each of those natural marvels has its own raft for carrying it to the mouth: porridge and pancakes for maple syrup; whole wheat toast for marmalade; scones for honey. You will disagree, and this is where beekeeping becomes engaging. And human. In beekeeping literature, the months April to September generate repetitive mantras of practical advice. But away from the mechanics of the hive, beekeeping isn't about insects, it's about human beings.



So here we are up early at the allotment, Wife and I. Wife has brought a picnic breakfast, her gardening gloves, her secateurs and a magazine. It looks like business, but only for a few moments. A few strategic snips of bramble stems, then she's settled into my chair with her magazine. This is my contemplation chair. To have someone else sit in it is more than an invasion of personal space. That chair, with me in it, is the hub, the think-tank, the policy unit, energy core of the multiple-branched operation that is my allotment. Usually it's just me here. I look out over the sea, I watch the coming and going of bees, I look some more at the sea, I nail together new frames, I think about things, I watch the sea, I don't think about things. Because that is the point of allotments, isn't it? Being alone. And the point of being alone is that you don't think about anything much. Obviously not everyone sees it this way.

"Don't sit too close," I warn her. "I'm taking out a few frames in this hive and they might just ---" She gives a small yelp and waves the magazine in the air. No, it turns out she hasn't been stung, she wants to read me something. "Here, listen to this. I've found just the present for you. When's your birthday?" I tell her. Each year I have to tell her. I never have to ask when her birthday is.

"It's perfect. This company offers a bespoke bee service. Honey bees at home. They come and do it all for you. They bring all the gear, the hive and everything. They fill it with bees. They do the inspections. They take off the honey and they fill the jars. All done. Sorted. You don't have to do a thing. How about that? Everything done for you. You just have to pay them." I look at her. She can't see my expression behind the veil of my bee suit. "And that would free me up to do ... what, exactly?"

"Help me in the house, of course."

We break for coffee out of a flask, and rolls with bacon in, followed by rolls filled with the sort of marmalade that stops me searching for the meaning of life. Dark and bitter.



It's July and the population in the hives is now going down. This means that queen-substance which controls the swarming impulse is more effectively distributed among fewer bees. Nevertheless, swarm control inspections are still necessary. Bees can swarm as late as the end of September. Last year I laced my autumn-feed syrup with a certain commonly available biostimulant. Composed of herbs, beet extract and molasses, the makers claim that it stimulates the colony, strengthens populations infected with nosema, has fungicidal and bacterial benefits and repels varroa. This is not a veiled advertisement, but I'd like to think that the supplement was partly responsible for the mass of healthy-looking bees I found on the Spring Inspection. Many bees, plus an embarrassment of over-wintered stores: supers filled with syrup, and late summer honey, much of it granulated ivy. I lifted out several laden frames in March and replaced them with foundation, to make room for the spring expansion. This made me think again about when to extract. This year I am adjusting to local conditions and waiting until later in August. Then feeding. Then varroa treatment. It's a balancing decision.

Rowland Molony
EDBKA



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Business Corner

Delivering Education to Beekeepers

In parallel to the development of the Course in a Case (CiC) materials to provide high quality teaching materials for beekeeping trainers, the BBKA, in conjunction with Fera, funded a series of events during the winter months. These were reported in the May issue of *BBKA News*.

The trustees of the BBKA and other groups with an interest in improving beekeeper education agreed that it was important that the impetus that had been generated was not lost during the current year. A programme of further training awareness events is therefore being arranged by Bill Cadmore, our Education Co-ordinator. These events will include some outside apiary-based days designed to show-case best practice in association apiaries during this summer. During the winter months a further series of events will be arranged, building on the higher level CiCs that will then be available.

Funding for these events will come from the BBKA's own education resources (partially funded by the Adopt a Beehive Scheme). A contribution has also been made by Fera through the Healthy Bees Plan programme towards the costs of the Education Co-ordinator. The programme is being overseen by a 'Delivering Education Group' comprising representatives of BBKA, Fera, Welsh BKA and the NDB. Representatives of Ulster BKA and Federation of Irish Beekeepers' Associations have also been consulted about how they can use the materials in their associations.

Enquiries about these training awareness days should be addressed to Bill Cadmore (bill.cadmore@ntlworld.com).

Martin Smith, BBKA President

Local Queen Programme

'Beekeeping associations are a natural focus for local breeding programmes. For a queen improvement programme to work it needs all the beekeepers in the local area to work together — maybe now is the time for your group to pick up the challenge' was the last paragraph of Martin Smith's article 'Importation of Bees: What are the Choices We Face?' in April 2011 *BBKA News*. Help for local BKAs has been in existence for some time in the form of the Local Queen Programme (LQP) that is organised by Bee Improvement and Bee Breeders Association (BIBBA). Details can be found on http://www.bibba.com/local_queens.php.

Several presentations have been given and these have varied from fourteen people in a beekeeper's house to six associations getting together to have one event with nearly one hundred attendees. Currently, one county is looking at all their divisions having a queen breeding programme. It is too early to say how they will go about it, but there is certainly a considerable amount of enthusiasm. The format varies considerably depending on personnel and facilities. In general it is those who are newer to beekeeping that are the most enthusiastic and want to provide good queens and bees for their members. LQP presentations can be tailored to suit local needs and can include using natural queen cells, raising artificial cells, colony assessment, colony selection and working together in groups. Encouragement is given to select and raise queens from local bees, not to bring them in from outside unless necessary. BIBBA do not tell beekeepers what to do; it puts forward a few suggestions and the beekeepers decide what they want. This varies a lot depending on the number of participants, their knowledge and the time available. The presentations vary considerably from a short talk to a full weekend. For those who would like further details either visit the BIBBA website as above or email Roger Patterson at roger-patterson@btconnect.com.

Roger Patterson, BIBBA

Education and Husbandry

In May *BBKA News* I reported that we expected to receive formal approval for a new Level 1 beekeeping qualification within the QCF. I am happy to say that this has been given and by the time you read this article the qualification will be out there in the 'big wide world'.

Why have we done this? you may ask. Well, firstly, BBKA wants to try and create access to beekeeping qualifications in the further education/vocational area where qualifications count towards skills that are recognised in the 'job market' and have value to the student. This contrasts with the BBKA qualifications, which are valuable as evidence of achievement and competence, but are not formally recognised in the further education sector. In a sense, we are starting to recreate the service provided by the 'County Beekeeping Instructors' many years ago, although this first qualification is a very simple one compared with the teaching that they provided. Secondly, we want to try and lift some of the educational load from associations. This will take time, but it will be good to be able to direct potential beekeepers, especially those who may be considering careers in horticulture or land management, to a place where they can join the mainstream vocational education system.

The question 'why are BBKA qualifications not externally recognised?' is one that we are often asked. The answer is complex

and will be explained in an article about training later in the year. In the meantime, what does this mean for BBKA members and their associations? First, try and encourage your local colleges to look at this course and consider adding it to their formal course offerings. Second, you may be approached to provide advice and guidance on the teaching and assessment of the qualification. A full course handbook is produced by Lantra Awards Ltd, the awarding body for this qualification, and more information is available on the BBKA website in the section 'learning about bees'.

The level of the qualification is very low; below what we would expect from a beekeeper holding the BBKA Basic Assessment. This is deliberate; we are aiming to provide the student with familiarisation in beekeeping and to carry out simple tasks under supervision. The Beginners CiC (white) provides more than enough beekeeping information for this course. As and when resources and funds permit, we hope to develop further qualifications at higher levels. Finally, I would like to thank Sally Wadsworth, John Hoborough and Ian Johnson for their many hours of work in creating the content, documentation and other materials required for the course to be offered.

Chris Deaves, Chairman, Education and Husbandry Committee

Classified Directory



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THE BRITISH BEEKEEPERS ASSOCIATION



The BBKA, an educational charity promoting beekeeping and educating the public of the importance of honey bees in the environment, is looking for a volunteer press officer to handle day-to-day calls from all sections of the media and to promote its work and policies.

Experience of working with the national press and good contacts within the environmental press is essential. Hands-on experience of beekeeping is desirable.

This is a part-time, home-based post. An honorarium will be paid and expenses covered.

Over the last four years, the BBKA's membership has increased by 100 per cent. The BBKA's campaign to raise public awareness of the plight of honey bees was recognised by the Government in 2010 with £10 million funding for the Insect Pollinators Initiative. The Press Officer will perform an important role in maintaining the high profile that bees and beekeeping has.

Those interested in applying for the vacancy are invited in the first instance to contact Ms Jane Moseley, Operations Director/ General Secretary, by email at: jane.moseley@bbka.org.uk, or by tel: 01920 463645 or 07827 966627

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Diary of Events

- 2011**
- 20–24 July.** RHS Tatton Park with Cheshire BKA.
- 9–11 September.** The Bee Conference, Royal Agricultural College, Cirencester. Details www.thebeeconference.org.uk or 01608 674429.
- 27–29 October.** National Honey Show, Weybridge, Surrey.
- 20–22 April 2012.** BBKA Spring Convention 2012.



Ocelli — A Hypothesis on their function

In the feature on Honey Bee Anatomy in May *BBKA News*, Graham Royle notes that the purpose of the ocelli is 'unclear'. In common with other sources, he suggests that they may act simply to 'enable' or 'switch on' the large compound eyes. I believe that their purpose is much more important than that.

As with all other species, the bee's anatomical features have evolved for specific purposes. Three ocelli in a triangular arrangement would not be required simply to act as light detecting photocells; only one would be needed for that purpose (perhaps two for redundancy). Three ocelli in a triangle, however, potentially give the bee the capability to define accurately and unambiguously the direction of its flight in azimuth with reference to the sun. That could not be achieved unambiguously with only two ocelli. If, like ommatidia of the compound eyes, ocelli have the capability to sense the polarity of light from the sun and their respective planes of polarity are at 120 degrees to each other, the light intensities seen by each ocellus would be different and would vary as their angle to the sun varies. The combinations of the three light intensities would be unique on a given heading and the reciprocal heading (for return to the hive) will be a simple inversion of the combination of light intensities sensed by the ocelli on the outgoing flight.

The ocelli are therefore essential for getting the bee sufficiently close to its long-distance destination to enable the compound eyes and other sensors to detect the local landmarks, colours and smells necessary for completing the journey successfully. I believe they are therefore vital to the survival of the bee. Experiments have shown that ocelli measure light levels, which is consistent with this hypothesis.

Russell Fairchild, Winchester and District BKA

In Response

I agree that anatomical features evolve for specific purposes and that the three ocelli are more than would be required simply to act as light detecting photocells. However, it is also clear from experiments by von Frisch and others that the bees' ability to navigate using the position of the sun as a reference is based on their ability to detect polarised light using their compound eyes — not their ocelli. Detailed study of the ommatidia, which form the compound eyes reinforces this understanding as the structures responsible for detection of polarised light have been identified, whereas no such structures have been identified in ocelli. That said, Goodman states that ocelli do indeed assist with flight stability and are found in other flying insects whereas they are absent or poorly developed in non-flying insects. Goodman further goes on to postulate that ocelli are used during flight to detect changes in the apparent position of the horizon and that the bee uses this information to correct for pitch and roll course deviation during flight.

Graham Royle, NDB

Daffodils

I have often wondered why I have never seen bees working daffodils, which seem to produce an abundance of pollen. I have heard an eminent beekeeper state that if your bees are working daffodils you should move them — they are desperate for food! I have sought an answer from many experts and have never obtained an explanation. Adrian Davis in *A Close-up of Bee-friendly Plants* — *BBKA News*, April 2011 provides the answer — 'You will not see honey bees foraging on daffodils ... Daffodils exude a natural defence toxin, called lycorine, which acts as a feeding deterrent.' However, this poses a further question. Since the purpose of a flower is to attract insects to facilitate pollination, why do daffodils have 'a natural defence' i.e. why do they defend rather than attract insects? Daffodils do set seed so how are they pollinated? FN Howes book *Plants and Beekeeping* states: 'Daffodils, narcissi and jonquils are of some value to the beekeeper for pollen, especially as they appear so early, but are of little consequence as far as nectar is concerned.' FN Howes' statement would appear to disagree with that of Adrian Davis. Can these two differing views be reconciled?

Brian P Dennis, Northamptonshire BKA

In Response

Daffodils, in common with many of the Amaryllidaceae, are found to contain one or more toxic chemicals (known as alkaloids) that include lycorine. Different parts of the daffodil have varying levels of this alkaloid — in particular the bulb is rich in lycorine and is known to be toxic to humans. Farm livestock and wildlife such as rabbits and field mice avoid eating daffodils. Slugs and snails seem to munch on the flowers, but not the leaves. So lycorine is present not to prevent pollination, rather to reduce wholesale destruction of the plant. I have not found any definitive references about the amounts of lycorine associated with daffodil nectar and pollen, but it is reasonable to assume there will be some.

And what of pollination? Caldwell and Wallace¹ have written extensively about *Narcissus pseudonarcissus* (the wild daffodil). They reported that the wild daffodil is pollinated principally by bumblebees — *Bombus terrestris*, *B. muscorum*, *B. hortorum*, *B. lapidarius* — and *Anthophora plumipes* (hairy footed flower bee). So why is it that honey bees do not do the same?

I speculate that *Apis mellifera*'s food storage behaviour makes them 'fussy eaters'. By not collecting daffodil pollen (or nectar) they avoid the build up of lycorine in the hive. If there is limited forage in early spring, they become desperate enough to use daffodil. A parallel can be drawn with buttercups (normally not worked by bees), for which a 'May sickness has been recorded', when used as distress forage.

Adrian Davis, Canterbury BKA

References

1. Caldwell J, Wallace JT. *Narcissus pseudonarcissus* L. *Journal of Ecology*, 1955; **43(1)**: 331–41.
2. Howes FN. *Plants and Beekeeping*. London: Faber and Faber; 1946.

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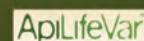
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Swarm Control

Why control swarming?

- Swarming reduces a colony and reduces the honey crop.
- Swarmers may alarm members of the public.
- Many swarms can cause a nuisance if they settle inappropriately.

Reduce the risk of swarming by:

- maintaining colonies with young queens
- making sure colonies have plenty of space for both brood and stores
- ensuring hives have adequate ventilation

Queen cells

Queen cells are built by the colony to replace the old queen. They are built in the brood nest and are larger than the other cells.

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Queen cells are built by the colony to replace the old queen. They are built in the brood nest and are larger than the other cells.

Feeding Bees

Spring

Careful feeding once a colony has started to forage will encourage the colony to expand faster. Use of a large colony is needed in time for the UK Seed Rape in April.

Summer

Feeding is not necessary in summer as bees will forage for nectar. However, if the weather is dry and the bees are struggling, a small amount of sugar syrup can be fed.

Autumn

Autumn is the best time to feed bees. They will use the stores to build up their winter stores. Use a 1:1 sugar syrup.

Winter

Feeding is not necessary in winter as bees will use the stores to survive. However, if the weather is dry and the bees are struggling, a small amount of sugar syrup can be fed.

Precautions

- Only feed bees with sugar syrup and not pollen.
- Do not feed bees with sugar syrup if the weather is wet.
- Do not feed bees with sugar syrup if the bees are already feeding.

Brood diseases

Recognising brood diseases

Brood diseases are caused by bacteria, viruses, and fungi. They can be recognised by the appearance of the brood cells.

European Foul Brood

European Foul Brood is caused by a bacterium. It is characterised by the presence of a white, creamy substance in the brood cells.

Asiatic Foul Brood

Asiatic Foul Brood is caused by a bacterium. It is characterised by the presence of a dark, crusty substance in the brood cells.

Nursemaid

Nursemaid is caused by a virus. It is characterised by the presence of a white, creamy substance in the brood cells.

Types of feed

- Syrup for feeding bees should be made from white refined sugar.
- Other types of sugar syrup are used for spring and summer feeding.
- Black sugar (2:1 sugar:water) is used for autumn feeding.
- Candy should be used if colonies need feeding during the winter.

Beehives

Choosing a hive

There are many different designs of bee hives available. Choosing which one to use can be a challenge for the novice beekeeper.

Modified National

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Choosing an Apiary Site

Meeting the needs of the BEES

- Adequate drainage
- Water supply throughout the year
- Early sunshine to start foraging earlier
- Shade from the midday sun
- Avoid frost pockets
- Shelter from the prevailing wind

Meeting the BEEKEEPER'S needs

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Apiary layouts

Three apiary layouts designed to minimise drifting.

Precautions

- Position hives to avoid drifting
- Fence the apiary to prevent livestock access
- Don't position hives under trees
- Choose a site which is free from the risk of flooding
- Site should not be close to public rights of way
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