

BBKA News

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NO.181 FEBRUARY 2010

In this Issue

Chairman's Letter	2
In the Apiary	2
Spring Convention	3
A Spring Present for Your Bees	4
How were the BBKA Research Priorities Decided?	5/6
The Forager	6
Laying Workers & Drone Laying Queens	7
Beeswax Exchange & Testing	8
An Unclear Case of American Foulbrood	9-10
Pros and Cons - Marking Queens	10
Taking the Medicine Pt. 1	11
Mel Asks the Experts	12
Honey, Sugar and Bees	13
Insect Pollinator Initiative	14
A Bee on their Bonnets	14
Economics of the Honey Bee Pt. 2	14-15/17
Dr. Giles Budge	16
Virus Infection and CCD	17
News from the NBU	18
Honey Bees, Bumblebees and Diseases	19
Natural Beekeeping Discussion Day	19
Field Testing	20
ApilifeVar® in the UK	20
Local Queen Rearing Programme	21
Poor Performance of Queens	22/23
EARS Project Takes Off	23
Your Letters	24/25
Trachael Mite	
Importance of Pollen	
Free Range Beekeeping	
Business Corner	26-27
Education & Husbandry	
Digital Technology	
Honey Recipes	
Vita Photo Gallery	
General Secretary's Report	
News Round	28
Diary of Events	28

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Two New Research Projects

News of Research into the Epidemiology of EFB

I am delighted to announce that in conjunction with colleagues at the National Bee Unit (NBU) of the Food and Environment Research Agency (Fera), BDI, which is owned by the participating beekeeping associations in England and Wales, is supporting a four year studentship at the University of York in a research programme into the epidemiology of European Foulbrood (EFB).

Currently it is considered that the bacterium *Melissococcus plutonius* infects and kills young bee larvae in what we know as EFB. Despite efforts to detect and control infections for over a century, incidence of the disease has been steadily increasing. This is an exciting opportunity to investigate the causes and gain a better understanding of this disease with the aim of accurate prediction on the extent of outbreaks of the disease, better

control and possibly its eventual eradication.

There will be extensive liaison with Fera, NBU, the University of York and their appointed student Ed Hayes who completed his undergraduate degree in Biological Sciences at the University of Oxford, graduating in 2008 with a 1st Class Honours degree.

BDI is proud to be involved, not only in partial funding but in the provision of general historical data (no personal information will be shared) and practical assistance for the researchers.

As many of my fellow beekeepers will know the Bee Diseases Insurance (BDI) scheme was set up not only to compensate those suffering losses as a result of equipment being destroyed because of an outbreak of foul brood diseases, but also to promote research into the causes of these diseases with a view to preventing them or certainly to alleviate their effects.

Bernard Diaper, BDI

BBKA to support LASI

BBKA is pleased to announce it has agreed to support work at the University of Sussex's Laboratory of Apiculture and Social Insects (LASI) in the Department of Biological and Environmental Science. It is to donate £36,000 over a two and a half year period.

The donation will be specifically used to support a DPhil student working with Norman Carreck and Dr Karin Alton on Project 1 of the Sussex Plan for Honey Bee Health and Well Being- 'Breeding disease resistant 'hygienic' honey bees'. The project will start in March 2010.

The BBKA support will be used in the screening of colonies headed by queens obtained across the UK for hygiene, determining which patriline are hygienic and then testing the colonies under beekeeping conditions. In addition the support will be used in developing methods that combine intra-colony selection with instrumental insemination and in developing improved methods for identifying hygienic behaviour using observation hives and individually marked worker bees. Lastly the funds will be used to look at the use of queens inseminated by single males or brother males in the breeding programme.

The funding is being made available from the BBKA Research Fund.

Dr David Aston, Chairman
BBKA Technical Committee

Bees and the Theatre

Further good news arrived on the eve of Christmas in the form of a donation of £10,000 from the Cameron Mackintosh Foundation.

The Foundation is funded by Cameron Mackintosh's well known theatrical business including the internationally successful musical, 'Les Miserables'. The objects of the charity include the development and promotion of musical arts but also cover medicine, the relief of poverty and refugees plus the conservation, protection and enhancement in the UK of nature and amenities of the countryside. On the basis of our application to the fund and with the agreement of their Trustees, the donation will be applied to our training and educational activities.

Tim Lovett

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Chairman's Letter

I write this note on the day after the (long) Annual Delegates Meeting held on Saturday 17 January 2010. The meeting, attended by around 100 delegates, honorary members, observers and candidates for election, is the policy making forum for the BBKA – the day where the votes of the delegates determine the policy and direction of the charity for the next year.

There were a number of key decisions made that I report on in the article on the inside back cover of this edition in more detail. There were also a number of announcements that the trustees were able to make at the meeting that I would like to draw your attention to.

At the ADM details of the first stage of the enhanced educational materials were displayed for delegates. This included the first 'course in a box' which was discussed at the 2009 October Forum. As a result of the increased income streams that the BBKA is receiving the trustees have decided that each association can apply for one free pack. Details of this will be sent to association secretaries shortly. These packs contain a wealth of information and useful detail, such as example fliers for a course, teaching style notes, feedback forms, as well as many more slides than the previous course material they replace. Further details and additional packs for sale will be available at the Spring Convention. As we know education of our members is vital for them to keep their bees healthy and the BBKA is determined to get as much practical help out to associations and branches to assist them in the work they already do.

I would draw your attention to the debate on the BBKA's policy of endorsing certain pesticides. I referred you to the papers in my last column, and I will not repeat the arguments here again. Firstly I would thank the delegates for the dignified way in which this debate took place. People I know feel strongly both ways on this issue and I am grateful that they were able to make their points without interruption and without resorting to ill judged remarks. Some of the arguments centered around public perception of endorsing any pesticide, despite general agreement that the specific pesticides themselves (synthetic pyrethroids) have been shown to be relatively harmless to bees – mainly due to their repellent effect. Against this arguments were raised that delegates felt that given a choice of two pesticides if the farmer was encouraged to use one that was less harmful to bees because of the BBKA endorsement then this was of benefit and should be continued. The vote in the end was 30% against endorsement, 63% to continue to endorse, with 7% abstentions. This compares with 35% and 40% against endorsement in the two similar motions at last year's ADM. The financial aspects of the policy (Income of £17,500 per annum) were not stressed in this year's debate with an acknowledgement that the increased membership had dramatically improved the strength of the charity and the revenue, whilst obviously welcome, was not a factor in making the primary decision of whether to endorse the products or not.

As with last year the Trustees were looking for guidance from the membership and we have been given broadly similar signals from the delegates. We will therefore continue to endorse the four specific products, but once again, will not accept any requests from an Agro-chemical company to endorse additional products. Meetings with representatives of the industry will also continue to take place to ensure that we are informed of developments and they understand our concerns.

Finally I was elected President of the BBKA at the ADM, so this is my last Chairman's column. Thank you for the kind words I have had about previous columns. I suspect you may hear from me again in BBKA news somewhere else though, and I wish my successor all good luck in the role.



Martin Smith, BBKA Chairman

In the Apiary



Now we look forward to meeting the bees again after the winter break. It can also be a difficult time for the bees as the older workers care for more and more brood as the queen increases her rate of laying. Particularly difficult if the colony is a small one or carrying a significant level of any of the common diseases. Feeding young bees needs a good supply of stores, pollen and honey, so the stores put away last autumn can be used up quickly especially if foragers are unable to get out.

A general oversight of the apiary should continue to check that roofs etc are still in place but while there you should now start hefting each hive to judge whether it has adequate stores. I do this by trying to lift the back of the hive by about half an inch; preferably after removing the roof. If it is so heavy that this is difficult, then all is well. If it comes up easily then that stock needs further checking.

On a day when the bees are flying well see what you can tell just by watching the entrance. Pollen being taken in is a good sign. If some stocks are not flying when others are out then those ones need a closer examination.

Open the hive carefully and look for signs of life; if it is clear that the bees are alive, not just robbers cleaning it out, then look on the outer combs for stores and consider moving one or more full frames nearer to the cluster. Alternatively, you could start feeding thin syrup. This is best done with a small contact feeder placed on the top bars just above the cluster. There can be difficulties with this type of feeder, but the bees are likely to get the syrup whereas with a Miller feeder they seem reluctant to leave the cluster to go up and over in order to feed. In February I give over wintered nucs some baker's fondant to help them along. This fondant is usually supplied in large pieces so I use it to fill empty margarine boxes, which store well in the freezer. When needed the lid is replaced with one having a half inch hole to give access and put over a hole in the crown board as close to the cluster as possible.

If you find that the bees are dead then close up the hive to prevent robbing and ask your Regional Bee Inspector if he would like to see it before you clean it up.

Do think about the oil seed rape (OSR) crop. If you plan to move bees to it for a crop, or if it comes to you, you need to decide how to use it. If you are looking for an early crop then you need to start feeding four or five weeks before flowering to have foragers ready, or you can use the OSR to build up the colonies for some later use.

If the weather is suitable March is a good time for a floor change; part of keeping our bees in clean, hygienic conditions. It can be done with very little disturbance to the bees, especially if two people can work together with one lifting the brood chamber and assessing its weight, while the other pulls out the old floor and puts in the replacement. This is a convenient time to remove the mouse guards and the spacers used under the crown board to increase the ventilation. Now the need is to help the workers to keep the brood area warm.

Correction: In the December issue of BBKA News I wrote that 74% of the dry weight of crystals of oxalic acid is oxalic acid, the remainder being water of crystallisation; that proportion should have been 71.4%. My apologies for the error, which is not enough to make any difference to the bees, or the mites.

Brian Gant, Devon BKA



Spring 2010 Convention

Stoneleigh Park Warwickshire CV8 2LZ

- **Members' Day - Friday 16 April** ●
- **Public Day - Saturday 17 April** ●
- **Education Day - Sunday 18 April** ●

Lecture Programme

Jamie Ellis: Plight of the Honey Bee • Florida Bee Research

Ingemar Fries: Nosema Ceranae • AFB

Declan Schroeder: Honey Bee Viruses • Deformed Wing Virus

Steve Martin: Bee Diseases in CCD • Beekeeping Problems in Paradise

Andy Willis: Bee's Eye View • Twelve Months of Forage

Andy Wattam: NBU Random Apiary Survey • The Role of the Bee Inspector

Gerry Collins: Queens and Things • Reading the Comb

Andrew Gibb: History of Beekeeping Equipment

Michael Young: Swarm Control • Learning From Others

Workshops

Microscopy • Build Your Hive • Maximising Your Wax Crop • A Taste of Honey • Cookery
Patchwork • Encaustic Art • How to Pass the BBKA 'Basic' • NBU Disease Recognition Seminar
Computerised Pollen Analysis • Training Trainers • Beekeeping for Beginners
Building a Successful Beekeeping Group • Introduction to the General Husbandry Assessment

For bookings please contact: Ruth Homer 01308 482483 - beekeepers@hotmail.com

New 'The Brood Box' Crèche

Enjoy the lectures and know your child is having fun too.
Bookable only in advance: age 3 – 7: limited places.
See website or call Tim Lovett: 01372 469086

Queen Rearing Event

Saturday 17 and Sunday 18 April
Margaret Thomas & Clive de Bruyn
Contact:
Mary Dartnall Tel/Fax 023 8077 5445

For Accommodation Contact: June Hughes 01256 464280 – june.hughesbees@hotmail.co.uk

Tickets

In advance: Members £13 Non-Members £18
On the day: Members £15 Non-Members £20

Tickets in advance (wrist bands) are available through the BBKA web-site or by postal application. Tickets purchased via the web-site after Monday 5 April will be made available for collection on the door. No postal applications for tickets will be accepted after Monday 5 April.

Postal applications: To receive wrist bands and one programme, send letter stating membership numbers and names for all wrist bands required, C5 (9" x 6") self-addressed envelope with a 90p stamp and cheque payable to BBKA to: Christine Hayward, 19 Kings Road, Leiston, IP16 4DA Tel: 01728 832487. E-mail: violinchristine@suffolkonline.net

Visit the BBKA website for more details: www.britishbeekeepers.com

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A Spring Present for Your Bees

It has long been a recognised management practice to replace three or four combs in the brood chamber each year with foundation as, we are told, “a forceful preventative against disease”.

The role of the combs and hive parts in harbouring the residues of Nosema disease can easily be demonstrated and treatment to combat it, to be fully effective, requires the colony to be re-housed and established on clean comb. The upsurge in vigour of colonies subject to the “Bailey Comb Change” procedure led me to incorporate transfer to clean comb into routine management; a practice I have been following for some twenty years. The recent successes with the “shook swarm” technique for the treatment of colonies infected with EFB is a further demonstration of the value of clean comb. The method described here is based on Dr. Bailey’s technique but without, in general, the use of a secondary entrance between the brood chambers. For maximum effect it should be started early in the spring, while the brood nest is still compact and with the intention of being completed before flow conditions begin. The method works well for colonies overwintered on a single British Standard size brood chamber; marginally less well on a “brood and a half”. For colonies in a double deep or on deeper frames, difficulties may be experienced if there is a significant pollen or honey arch above the brood area, which the queen may be reluctant to cross.

The method is as follows, remembering that it is good apiary hygiene to sterilise all hive parts before re-use.

STEP 1: Remove hive roof and inner-cover, (Fig 1A). Remove all unoccupied peripheral combs from the brood chamber without disturbing the brood nest in any way, (Fig 1B). Insert dummy boards against the outer brood combs to avoid the construction of “wild” comb in the spaces created (Fig 1C). The wax and any left over stores can be recovered.

STEP 2: Prepare frames with fresh foundation equal to the number of combs occupied by brood. These are placed in a clean brood chamber above and exactly in line with the brood combs of the colony, (Fig 2A). Early in the season the bees are reluctant to draw stale foundation so for rapid comb building the freshest foundation is essential. The substitution of one or two clean, pre-drawn combs makes the transfer quicker and easier for the weaker colonies and

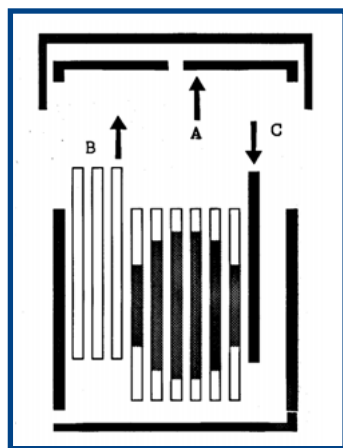


Figure 1

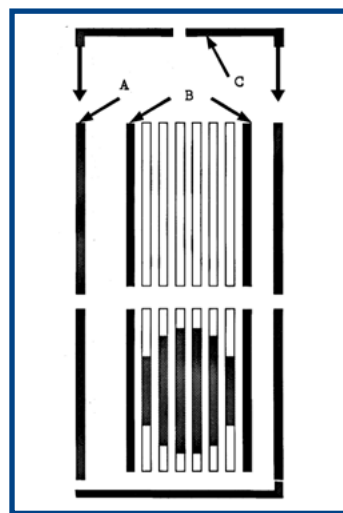


Figure 2

they should be positioned in the middle of the new brood chamber. Their use is by no means necessary with normal colonies. Fill out the flanks with “dummies”, (Fig 2B) and close the brood chamber with a clean inner cover, (Fig 2C).

STEP 3: Honey bees are unable to secrete wax and draw comb in the absence of a sugar-rich income. It is therefore essential to feed sugar syrup (contact feeder) and it is necessary to continue this feeding until natural nectar flows take

over. However, since the object is to encourage comb building not food storage, the amount required is usually quite small and is best offered intermittently, in small quantities of “thick” syrup. (Fig 3) Fumagillin (Fumidil B) may be incorporated into this initial feed where Nosema disease is troublesome. The colony will gradually begin to draw comb in the upper brood chamber and develop its brood nest there.

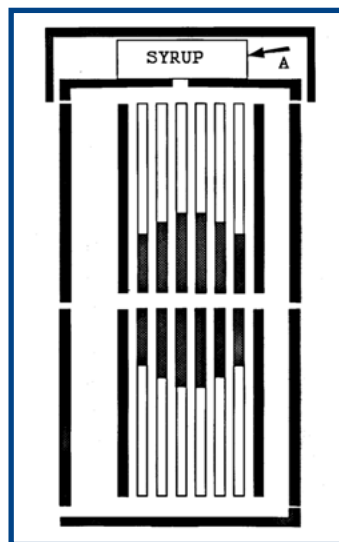


Figure 3

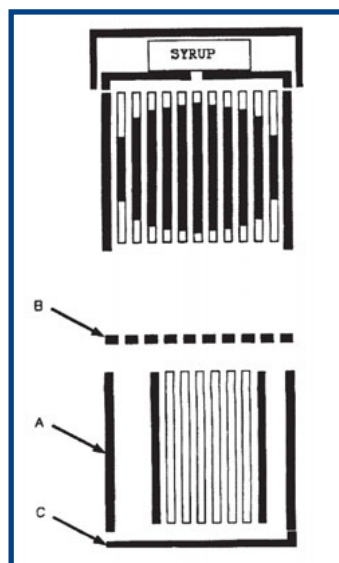


Figure 4

STEP 4: As the brood nest expands into the upper chamber it will become necessary to add additional frames of foundation until this chamber is full. During the early spring inspections the queen is likely to be found here and, when she is, should be prevented from returning to the lower chamber with a queen

excluder. Make quite sure the queen really is in the upper chamber. With no more eggs being laid in this lower chamber, within twenty one days all worker brood will have emerged, leaving it virtually empty.

STEP 5: The lower chamber can now be removed together with the queen excluder, (Fig 4A, B). The combs it contains can be melted down or sterilised with acetic acid. A clean floorboard should be provided. (Fig 4C). Continue to feed if necessary.

STEP 6: The colony is now well established on new, clean combs. It should be developing rapidly, free from residual disease vectors and its management can revert to the beekeeper’s normal practice from now onwards.

The merits of the technique are:

- it isolates the colony from carry over of disease residues;
- it mimics the natural tendency of the wild colony to rear brood in new comb;
- the queen is able to lay in newly built, uncluttered comb, enhancing colony build up;
- it provides work for the wax-builders, helping to delay the onset of the swarming urge;
- it provides space at a critical time in the colony cycle.

The drawbacks are:

- it is not suitable for districts which rely on very early flows, such as oil seed rape (there are other routes to the same end);
- it may cause additional work in out apiary visits, making up frames etc.;
- the cost of the small amount of feeding should be recovered through more vigorous and productive colonies;
- experience has shown that the cost of foundation will be recovered through increased wax production.

And the end product:

- a vigorous, healthy colony.

John Powell

This article was first published in BBKA News February 2002

How were the BBKA Honey Bee Research Priorities Decided?

The starting point for the BBKA research funding campaign was the growing realisation over a number of years that funding for honey bee research in the UK had not kept pace either with general inflation or with the growing threats to beekeeping around the world. Matters came to a head with the loss of a number of long established honey bee research posts in 2006. This loss of internationally renowned bee pathology expertise at precisely the time when extensive honey bee colony losses, apparently due to disease, began to be observed in the USA and elsewhere, seemed particularly unfortunate.

There is a long history of research into honey bees in the UK². This includes the pioneering observations of the Rev. Charles Butler in the 17th Century, of the Rev. John Thorley in the 18th Century, and of Charles Darwin in the 19th Century. These researchers were however, either men of independent means or clergymen with plenty of spare time in which to study. From the beginning of the 20th Century, honey bee research has been carried out by professional scientists.

Following the devastating losses of honey bees in the early years of the century, due to the 'Isle of Wight disease' and foulbrood, it was recognised that, in view of the enormous economic contribution made to the UK economy by honey bees through the pollination of crops and wild plants, it was appropriate that research into bee health should be funded by the Government. To this end, important apicultural research programmes have been funded by the Board of Agriculture, later MAFF and latterly by Defra. From the 1930s onwards, however, additional funding has often been supplied by beekeeping organisations such as the BBKA and the C B Dennis Beekeepers' Research Trust, and by agrochemical and veterinary companies.

These UK research programmes have produced important advances in our understanding of bacterial and viral pathogens,

parasites such as *Nosema apis*, *Acarapis woodi*, and *Varroa destructor*, and the complex interactions between them. Important studies on pollination ecology, honey bee biology, honey bee behaviour, and the poisoning of bees by agrochemicals have also been carried out. The contribution of UK honey bee researchers towards the body of world knowledge has been greater than their limited numbers and the modest financial investment might at first suggest.

The costs of carrying out research have, however, greatly increased in recent years, and by the turn of the 21st century it had become evident that the sums of money invested in honey bee research had become inadequate to ensure the continuity of a stream of experienced researchers, essential in order to deliver an effective policy based research strategy. This was against the background of a significant erosion of UK research in the biological sciences, with the closure of whole research institutes, individual research stations and redundancy of researchers at other institutes. In the period between 2000 and 2006, more than 660 staff were lost from UK public science institutes.

One serious problem has been that honey bee research is of a very applied nature (ie of direct benefit to industry), whilst much science funded by the government's research councils is deliberately of a strategic or fundamental nature (ie science carried out through a spirit of curiosity). It has therefore, in recent years been just possible (but never easy) to, for example, obtain funding to study the behaviour of bumble bees, or their conservation, but virtually impossible to obtain, for example, funding to study the epidemiology of European foulbrood in honey bees, which remains poorly understood, despite its common occurrence in colonies.

The BBKA therefore felt that if it did not make a public stand about this erosion of honey bee research, the UK research capability could fall below the critical mass needed to be sustainable. As a result, the

BBKA Public Affairs Committee decided to organise a Research Colloquium at Stoneleigh on 6 July 2007. Invitations were sent to UK honey bee researchers, possible fundholders, including Defra officials, and representatives of beekeeping organisations. This successful day was widely reported in the bee press^{3,4,6}. One purpose was to assess current honey bee research, and it became apparent that whilst there was a wealth of potential expertise in UK universities and other institutes, the bee research that was being carried out was all being done on a shoestring budget, and most significantly with no overall strategic plan or list of agreed priorities. Following the meeting, a suggested list of honey bee research priorities was worked up into a roughly costed list which was presented by the BBKA to the then Farming Minister, Lord Rooker in October 2007.

A month later, Defra's Draft Bee Health Strategy was published. Encouragingly, Chapter 10 'Delivering the strategy: science

and evidence base' stated : *'This section is under development. It is likely to set out: current areas of research funded by Defra, research councils, national associations and other potential bodies; how Defra will work with others to identify key gaps or priorities for further research, including effective communications with research community; and how best to address these gaps drawing on all potential sources of funding. From Defra's perspective, applied research to support policy development and operations will remain the highest priority'.*

Following the request from Lord Rooker for it to produce fully costed proposals, the BBKA Public Affairs Committee organised a meeting of UK bee researchers, which was held at the University of Sussex on 11 April 2008. Hosted by Prof. Jonathan Bacon, Dean of Life Sciences, the purpose was to 'peer review' the draft list of research proposals. Invitations were sent to researchers at eleven UK institutions working on honey

Continued on Page 6

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The Forager

It's Been a Funny Old Year!

So many beekeepers I have spoken to just recently have used this phrase that I am obliged to believe that it is true. But I seem to recall the very same beekeepers saying the very same thing this time last year and the year before and the year before that. When I think about it, I cannot remember a year that has not been 'a funny old year'. But what exactly do we mean by that phrase? If we mean that it was not at all predictable and was quite different from any other year we can remember, then surely every single year is 'a funny old year'? Why should we expect any particular year to be predictable – we live in the British Isles after all?

But if we recognise that there is no predictability to our seasons and our weather, why do so many beekeepers still insist on doing their beekeeping predictably and by the calendar? Perhaps it stems from the way many beekeepers have learnt their craft – by rote, rather than by using their own innate intellect to think things through using the stimuli which are all around them. A typical example is the numerous beekeepers who apply large quantities of sugar syrup to their colonies as stores in late August and into September even though there is often an outstanding autumn nectar flow. When I enquire why, the reply is usually 'it is what I was told to do when I first started beekeeping'.

One thing I have noted during the years is just how much our seasons are changing. Years ago the June gap was often a reality but today, if we see a gap, which does not occur every year, it can be anytime from late April until July and it can last anything from a few days to several months! Indeed in some areas in 2008 the June gap lasted almost 3½ months. And is it my imagination or does the season seem to start earlier some years than it ever did. We can see another key difference in the impact that ivy can have. Many beekeepers, particularly in the southern half of the UK, now have no need to do any autumn feeding as copious quantities of both nectar and pollen are available from the ivy.

So with the ever changing environment as a background to our beekeeping, isn't it more appropriate to adjust our beekeeping

practices to the environment rather than try to get our bees to conform to some arbitrary calendar? But this will, for many beekeepers, mean a fundamental change in their approach to their beekeeping. Each inspection of their colonies will require firstly that they understand what was happening in the colony last time they inspected (keeping hive records will help in this respect) followed by an anticipation of what to expect this time around. Armed with this expectation, a very quick evaluation can be made as to whether the colony is or is not performing to expectations. If it is, then carry out whatever actions are required, make the notes on the hive record and leave the colony with minimum intervention. If it is not performing to expectations then it is essential to observe all of the clues to enable a judgement as to understanding why not. These may include observations on swarming preparations (queen cups, open or sealed queen cells), brood pattern (poor queen, disease, inadequate stores, etc), available space (brood combs pollen or stores clogged, poor combs needing replacement), available stores (are there adequate supplies of both nectar and pollen to feed the brood) as well as physical condition of the hive. If you have been able to observe all of these factors then you will have all of the information you need to make a considered judgement on how best you can help your colony.

I know that for some beekeepers this approach will come as a surprise. Many beekeepers in the early stages of their career like to look at colonies very frequently – I would ask them to consider what they feel is likely to have changed within the colony from one day to the next. Some of the more established beekeepers tend towards the other extreme and only look in their colonies when treatment is necessary or when removing honey. Of these beekeepers I would ask why they expect significant events only to occur on the days they are examining their colonies.

Above all, I would ask all beekeepers to give more thought to what is occurring within the hive. Try to improve your understanding of the natural history and life cycle of the bee – it will make your beekeeping even more enjoyable and, for some, it will make it more productive as well.

The Forager

How were the BBKA Honey Bee Research Priorities Decided? ...cont

bees including the CSL National Bee Unit, universities and research institutes. The meeting was well attended, and the list of priorities was debated at length. As well as from those scientists already working on honey bees, valuable contributions were also made by neurobiologists, ecologists, molecular biologists and geneticists who did not work on bees, but who supplied complementary insights. This 'peer review' is a vital part of the scientific process. Proposals for research grant funding, and papers to be published in academic journals are routinely subject to scrutiny by experts in the field.

The resulting list of urgently needed honey bee research work was costed at an estimated £8 million, and this figure was

subsequently presented to MPs and peers at a Parliamentary Briefing held at Westminster on 22 April 2008. In the following months, these outline proposals were expanded to include a 'Concept Note' on each of the suggested twelve research programmes. In January 2009, the BBKA published its 'Honey Bee Health Research Concepts' document¹ which is available to download from the BBKA website. This represents the first time that the varying research needs of UK beekeeping have been drawn together in one place.

The concept notes directly address the current threats facing UK honey bees, principally from pests and diseases including *V. destructor*, *Nosema spp.*, European foulbrood, the small hive beetle, and viruses, together

with environmental factors such as habitat loss, and its effects on bee nutrition, and pesticides⁵. Possible means of addressing these problems through bee breeding and queen rearing, improved bee husbandry and habitat recreation are suggested. Finally, study of the possible medicinal properties of UK honey is proposed as a fruitful area for research.

It is hoped that 'Honey Bee Research Concepts' will be used by Defra as a discussion document, and subsequently as the basis for commissioning honey bee research. The announcement in July 2009 of the Insect Pollinator Initiative has led to a flurry of research proposals being submitted, a number of which directly address some of the BBKA concepts. It remains to be seen, however, how much of this £10

million fund, if any, will be spent on honey bees.....

Norman Carreck, NDB

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Laying Workers and Drone Laying Queens

As the winter recedes there will be some colonies that have died through a number of factors and some that are looking a bit weak but still just surviving. We all hope that our colonies will come through winter strong and healthy and be ready to take advantage of the good weather and forage to build strongly for spring.

Sometimes the queen dies over winter and the colony is unable to produce more workers. As the brood hatches and the pheromones in the hive change some of the workers will develop enlarged ovaries and start to produce pheromones similar to queen substance. The 'laying workers' will lay unfertilised eggs resulting in only drones.

Sometimes late developed queens will not have had the chance to mate before winter or have only partially mated and run out of sperm. In these cases the colony will try to build up but the queen is only able to lay unfertilised egg that will result in drones. In effect the colony will be unable to produce new workers and, as the old workers die off the colony will dwindle until it is hopeless.

It is important that either of these conditions is recognised as soon as possible so that remedial action can be taken. Unfortunately you need to know the difference between laying workers and drone laying queens as the action taken will be different.

In both cases the symptoms are drones developing in worker cells. These will have the characteristic high domed cappings and, of course the numbers of workers in the colony will continue to reduce. To find the difference first look at the brood pattern. Laying workers tend to lay eggs randomly in the cells; there is no neat pattern so the brood looks very patchy.

Then try to find cells with eggs in them. If you have a drone laying queen there will be a single egg in each cell, laid neatly in the bottom of

the cell. If you have laying workers you will find more than one egg in some cells, indeed sometimes there can be as many as ten eggs in a cell. Laying workers are unable to reach the bottom of the cell so the eggs are laid on the side of the cells (quite different to queen laid eggs). The following table gives the indications of laying workers or drone laying queens as compared with a normal queen.

Normal Queen	Drone Laying Queen	Laying Workers
Regular brood pattern	Regular brood pattern	Random or no brood pattern
Single egg in every cell	Single egg in every cell	Multiple eggs in a cell
Eggs laid at bottom of cell	Eggs laid at bottom of cell	Eggs laid on side of cell
Slightly domed brood cappings	Highly domed brood cappings	Highly domed brood cappings
Plenty more workers than drones	Few workers, more drones	Few workers, more drones

If you determine that there is a drone laying queen there are two courses of action. Acquire a new queen (if possible), remove the old queen and replace it with the new queen in a Butler cage (or use your favourite method of queen introduction). If this happens when it is not possible to get a new queen then the colony is doomed if left alone and may as well be combined with another colony with a normal queen.

If there are laying workers in the colony the situation is a bit more difficult. It is not possible to differentiate between laying workers and normal workers and, even if you could the workers tend to reject a new queen. If you tried to introduce a new queen into this hive it would probably be killed. The best way to deal with a colony of laying workers is to find another colony and place it on the site of the colony with laying workers. Remember if the colony was within three miles of this site it should be moved away first or moved no more than a metre every other day until it is within a metre of the hive with laying workers. The hive with the colony of laying workers should be emptied of all the bees about two metres away from the original site. Laying workers will remain on the ground and die whereas the 'normal' workers will be submissive and enter the queen right hive you have placed on the original site.

Unfortunately in recent years there has been an increase in queens that have not mated perfectly or have been weakened by disease. This has led to more colonies with drone laying queens or laying workers where the queen has either died or finally been rejected by the colony. It is important that you can recognise the symptoms and act quickly before the colony becomes too hopeless and all the bees in it are doomed.

Ivor Davis, NDB

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Beeswax is valuable. On the world market, good quality, refined and accompanied by a health certificate New Zealand beeswax costs over £4.00 per kg or £1.82 per lb. The message is therefore, look after your cappings and combs.

Beekeepers can reap the benefit of carefully cleaning and preserving their beeswax by participating in either a 'Wax Conversion' or 'Straight Swap' scheme.

'Wax Conversion': Put simply, if you offer for example 9 lbs weight of clean wax to a foundation supplier you will receive back 9lbs weight of finished foundation which equates in BS deep size to 72 sheets. You pay for having the 9lbs of wax converted into foundation and perhaps wired by your supplier. This is an old, tried and tested system used all over the world and very popular, but you can often end up with far more foundation than you require.

'Straight Swap': however is I believe peculiar to the UK. Knowing how canny British beekeepers are this idea was introduced by Thorne's a few years ago. For your 9lbs of wax this time you receive 34 sheets of wired foundation, but no money changes hands. The supplier has retained the balance of the wax to cover the costs of manufacturing the foundation, any wiring and a profit margin.

By taking advantage of either scheme with any of the suppliers the beekeeper can quite easily afford to exchange combs regularly. This is very important to the health and long term welfare of the colony. Honey bees at the end of the day are animals and livestock and need caring for just as you would cattle, dogs or sheep. Their living accommodation needs cleaning and replenishing. Not perhaps as often as cattle.....

There is a view that by heating beeswax to

liquid form and keeping it in this state for several hours, it will somehow become pure and any disease pathogen that might have been present is removed.

Wrong..... Irradiation is the only sure way of killing foulbrood spores in beeswax. A very costly and time consuming process. It is recognised however that any foulbrood spores from contaminated combs are trapped by beeswax molecules during the foundation making process and cannot therefore cause further contamination. Neither will heating beeswax remove traces of pyrethroids, these are readily absorbed by beeswax.

There is another fallacy that surmises foundation manufacturers analyse the wax they receive to ensure it is as pure as possible and free of contaminants and disease pathogen.

Wrong.....To test a sample of wax to just a BP (British Pharmacopoeia) specification will cost £160 (ref. Salomon & Seaber-Analytical Chemists). To test it for chemical contamination from Paradichlorobenzene or for residues from Bayvarol and Apistan or foul brood contamination and you can probably double the fee. All suppliers assume the beekeeper is providing wax as clean as he/she can possibly make it and expect that nothing else has been added to increase the weight or irreparably contaminate it. When you consider all suppliers receive

thousand of kilograms of wax per year from honey soaked scraps in a carrier bag to pristine 25kg blocks, to have samples even randomly tested is not feasible.

Experienced foundation producers can often tell from the texture, odour and fracturing of the wax whether it has been intentionally adulterated. Several years ago it was fairly common to find blocks of wax from African sources to be adulterate with heavy rocks, just to increase the weight. We have even known unscrupulous beekeepers in the UK to try and trade in blocks of tallow/animal fat for beeswax foundation.

So gather as much wax as you can. Even scrapings from top bars and bits of brace comb. If you do not have enough in your first years of beekeeping to exchange just store it. Like honey it does not deteriorate with age. Just remember when you do trade it with your supplier make sure it is as clean as possible and free of dead bees, cocoons, honey, rocks, bricks and iron bars!

Paul Smith

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An Unclear Case of American Foulbrood

Sometimes the disease does not follow the book.

I had a plan

Early last spring 2009 I found a smallish colony with clear symptoms of American foulbrood (AFB). Though it annoys the state of Ohio inspection people, I frequently need AFB for testing, teaching, or for photographing. I put the colony away from other colonies in an isolated university yard and made plans for a future article. Today is that 'future article' day.

My plan was to give you an 'on the scene' report as I worked my way through the sickly colony. Photographs would support the typical symptoms of the malady. I took a cooler of pop and water. I had my laptop computer and a fully charged battery in my camera. Today was to be a good bee article day!

What I found

What I found was very different. Grass and weeds had grown to the point that I initially had trouble finding my sickly colony. At 8:30 am, it was already 25°C and was bright and clear. That means it was hot from the start. And then there were the bees. They were matted on the front of the colony in a thick blanket of 'beedom'. I thought this colony would be at the brink of death, but here it is – thriving. My thought at the time? *Well, it must be one of those colonies that recovered from AFB.* I get that from time to time. Clearly, I would have to have a look; and clearly, this was going to be hotter work than I expected.

Fired my smoker

I fired my smoker, cognizant of the fact that everything was hot and dry. As do some of you, I have heard stories of beekeepers starting fires with their smoker. I was extra careful. I was already sweating as I rummaged for my sticky hive tool and made my way through the weeds with the puffing smoker at the ready.

Using woodchip-fired smoke, I filled the air with smoke and bees, perfectly aware that I was really getting away from my original article writing plan now. But to my surprise, the bees were gentle and agreeable. There was only a very

scant nectar flow ongoing. Bees were hanging on the front of the hive – unemployed. I was expecting them to try to attack me – a strange, but pleasant surprise.

The outer cover and the inner cover were soundly stuck down. I was tempted to say, *'I wish I had a lot of sick colonies like this,'* but I got control of myself. I should never forget that this colony had AFB earlier this year. Even in a colony like this, that is bad. Do not tinker around with this stuff.



Figure 1. Looking healthy, but actually AFB ill

Opening a stuck hive

With burr comb and propolis, the small crowded colony was soundly stuck together. When opening any hive equipment stuck together like this, diseased or not, the opening procedure is always the same. Break the seals at the joints, all the while lifting on the front of the super being removed. *'It's not easy.'* A common occurrence that happened today was that bottom frames were stuck to upper frames by either burr comb or ladder combs, which are essentially the same things.

So with one set of fingers trying to pull the full super upward, I used my left hand, holding the hive tool, to search about trying to break the bottom frames loose. As is usual for me, I was working alone. All I could do was grunt, groan, and strain. Finally, the top super was loosened. Using a shearing motion, I twisted the super nearly sideways and lifted it from the bottom hive body, which was actually a super, too. Honey is always heavy. In the past, I have written about gadgets to help me with such heavy loads, but I did not even know where these invaluable gadgets were now. So, as I usually do, I sat the full, heavy, sticky, bee covered super on the upturned roof. Weeds, bees and

sweat were everywhere. The colony was packed with bees and honey – really not what I was expecting.

What was I expecting?

I was expecting the traditional AFB infected colony. I was expecting the soured odour that accompanies advanced cases of this disease. I was expecting an extremely scattered brood pattern with dead scale and greasy, punctured cappings in abundance. I was expecting a greatly reduced adult bee population. What I was not expecting was small hive, full of bees and honey

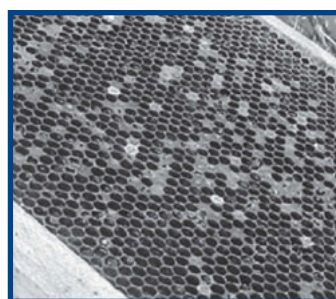


Figure 2. Typical American foulbrood. This is what I was expecting

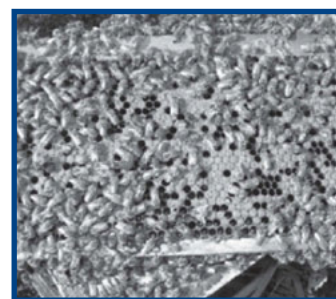


Figure 3. But this is what I found

Is this colony AFB sick or not?

Through the past years, I have seen healthy colonies that were not thriving as well as this colony. Yet, make no mistake, this colony has AFB. True, the hive occupants looked healthy, but the brood pattern was spotty. That could have been from a lot of things, not just AFB. If I did not know this colony's history, I would not have immediately jumped to American foulbrood as a possibility. The combs looked good and well maintained, but closer inspection showed occasional dead and dying pupae as demonstrated by their less-than-pure-white colour. But the big give-away was the presence of punctured cappings. So what appeared to be a crowded, wanting-to-grow colony was actually doing a pretty good job of coping with its disease.

Punctured cappings

Punctured cappings are only one of several symptoms that indicate a colony has AFB. In *Bee Culture*, 2004, I discussed American foulbrood¹ in some detail and I included sources for more information². The puncturing is done by house bees as they begin the cell cleaning process. No single bee does the entire cleaning job so it takes several bees to uncup and remove the dead tissue. Obviously, bees do not have mop buckets. The only way to remove the dead material is to eat it. This is a pretty gruesome task, but very necessary for hive hygiene.

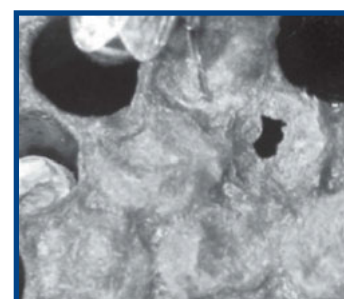


Figure 4. An AFB punctured capping

Be prepared to see frequent nicely rounded holes in cappings as nurse bees cap larvae as they begin to pupate. That cylindrical hole is perfectly normal. It is the ragged holes of which you should be wary. Do not confuse them.

Should I admire or fear this colony?

At first blush, when I realised how mightily this colony was fighting for its health, I admired and respected it. While clearly ill, this colony continued to grow and prosper all the time harbouring a serious disease. The point is well taken. At *some* times, *some* colonies can withstand *some* strains of AFB remarkably well. In diseased colonies long passed. I have had colonies completely recover from AFB infections. Problem is that you and I can never tell when and where such a desirable attribute will show itself. So as I compliment this specific colony for its efforts (and even consider helping with some antibiotic), I must remember that it was susceptible enough to come down with AFB in the first place. A much more admirable colony would not have allowed any expression of AFB. Now that this

Continued on Page 10

American Foulbrood ...cont

particular fighting colony has a clear case and yet continues to survive has done a pretty good job of unintentionally masking the disease much as Terramycin® would have done.

There is a good chance that this is a 'Typhoid Mary' colony. While it is able to tolerate the disease and perpetually hang on, no doubt other colonies would not be so genetically lucky. So long as robbing and drifting are not an issue and so long as I do not make splits from this unit, it will probably sit there for a long time just being a pretty good hive. Then one day something will go wrong. The resistant queen will be replaced with one not as resistant to AFB or mites will weaken it to the point that robbing begins. This colony is a future source of American foulbrood for other healthy colonies.

Or on the other hand

On the other hand, as long as I am guessing, possibly the queen would die and a new queen would take the reign having prodigy even more resistant to AFB than the previous queen. Possibly, but probably not, I do not know why. Maybe, it is because AFB is as adaptive as resistant bees.

A strange thought

My ramblings lead to a strange comment: *It's probably better for most beekeepers to have the colony die from AFB than for the colony to co-exist with it.* I mean no offense to anyone reading this, but some (many?) beekeepers would have missed the disease in this colony. I have a sensitive sense of smell and there was no hint of the usual AFB odour. This noble colony with a disease fighting spirit could very well infect other colonies if left untended.

The prognosis?

Through a scheduling fluke, shortly after I left the location where this diseased colony and a few other suspicious colonies were positioned, the county bee inspector showed up for my

annual inspection. I can tell you that his recommendation will be to destroy everything. The risk of bees and equipment spreading the disease would not be worth the benefits derived from saving one diseased colony.

My opinion is not as firm. Just a few years ago, I would have gassed the bees and burned the equipment and never looked back. Now the cost of replacement packages is high. Mites are afflicting other colonies and bees are generally in short supply. The question that is begged is, 'When do you stop killing bees to save them?' This is what I am going to do, but my procedure is not a general recommendation for others.

My (new) plan

I have already moved the colony to a remote site for convalescing. My sister agency, the Ohio Department of Agriculture Apiary Inspection Service knows that I have this situation.

I will have to vacuum the bees from the diseased equipment and feed them antibiotic while confined. The disease brood comb should be destroyed. The bees should be put onto new comb and fed sugar syrup and antibiotic until new frames are produced and/or brood is produced. The primary thing I am doing is removing the bulk of the AFB spores – the diseased brood comb. Fortunately, the equipment is old and destroying it will not be painful. I have never been much of a supporter of scorching the insides of hive equipment so the stuff will just be burned.

What should you do?

Am I doing anything that you could not do? No. Am I recommending that the next time a colony of yours comes down with this ailment that you try this procedure? Absolutely not! The point I wanted to make in this piece is that all AFB infected colonies do not look like the typical AFB photos in the typical

Pros and Cons

Continuing the series of articles looking at the differences that affect an aspect of your beekeeping giving an opportunity to consider the good and bad points and make your own decision on what suits you best.

Marking Queens

Pros

- Marking queens allows the identification of an individual queen. This identification is useful for the purposes of queen rearing or scientific study.
- A marked queen may also give clues to (or identify) the origin of swarms, allowing the beekeeper to check the issue of casts.
- It may also assist in the planning of queen replacement as a queen's age can be readily determined (if the beekeeper uses a system to identify the queen by the year she was produced).
- The presence (or absence) of a previously marked queen can be used to determine whether a colony has lost the previous queen or whether she just 'went off lay' after a period of several weeks of apparent queenlessness.
- The presence of a brightly coloured mark can make the queen easier to see and is essential for this purpose of observation hives on display to the public.

Cons

- Queen marking requires either the handling of the queen or the use of a marking cage and other equipment, depending on the method of queen marking (paint, paint pen, adhesive discs, scissors for clipping the wings, etc.)
- The popular year code system is not universally used and is not universally useful (I know a beekeeper who cannot tell the difference between some of the colours used as he is colour blind! Another beekeeper I know marks all his queens pink as all his other coloured paints have dried up.)
- Queens may need to be re-marked as the paint wears off.
- There is a small risk that the handling and marking of a queen may damage her or lead to her being superseded.
- Marking queens necessitates some degree of handling and therefore the dexterity and visual acuity that this entails. (An old beekeeper who was one of the first to teach me about beekeeping once admitted that he had not put on his glasses when he tried to mark a queen and inadvertently marked 'the wrong end'!)

Richard Bache, Somerset BKA

bee book. No doubt this is the type of colony that unintentionally destroys the remaining colonies in the yard. It is the thing beekeeping disasters are made of. Playing with American foulbrood is very serious play. You need to know what you are doing and what is legal in your locale. This disease will take you and your bees down.

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1 Tew, James E. 2004. American Foulbrood - Beyond the academic discussions – real world questions and answers. Bee Culture. September, 2004.
21 For basic information on American foulbrood, look at: <http://www.barc.usda.gov/psi/brl/bd-amfb.htm> or http://maarec.cas.psu.edu/beeaware/Dis_Info/Brood-Dis.html

AFB is a notifiable disease under the Bee Diseases and Pests Control Orders (for England and Wales) and is subject to official control by a programme of apiary inspections carried out by the NBU. Control of the disease is through compulsory destruction of infected colonies, which is a very effective measure. This eradication policy has been highly effective since the 1940s when first introduced, bringing the incidence of foul brood down from several thousand infected colonies per year to less than 100 nowadays. In recent years disease incidence has been characterized by sporadic but large outbreaks which have been rapidly brought under control by the inspectors and beekeepers working together.

The use of antibiotics to control AFB is not permitted in the UK.

Fera publication 'Foul Brood Disease in Honey Bees'

C. WYNNE JONES

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Taking the Medicine – The Background



This is the first in a series of articles in BBKA News during 2010 to help broaden knowledge and understanding of the processes surrounding the discovery, regulation and proper use of bee medicines. It is a cooperative initiative between the Veterinary Medicines Directorate (VMD) and the BBKA.

They will seek to inform rather than proscribe. We have too few medicines available, but in our own best interest, that of our bees and consumers of our hive products we must use these responsibly, if they are not to be rendered useless prematurely through the development of resistance or worse still, be found as residues in honey damaging its wholesome image. This first article is an introduction to the series and reports a recent important EU initiative to try to improve the availability of honey bee medicines.

Diagnosis of disease has become an ever more important part of honey bee husbandry. Gone are the days when the beekeeper could simply keep an eye out for suspicious developments in the brood nest in the fight against foul brood. With the arrival of varroosis and more recently, concern over *Nosema* species infections, diagnosis and management of bee disease has assumed a more pro-active role. Accurate diagnosis must be complemented by the appropriate therapeutic response, be it bio-technical or chemical treatment with varroacides, for example.

The use of pharmaceutical agents brings with it a regulatory discipline which starts at the lab-bench, with the discovery of the medicine, through its clinical and pharmaceutical development, approval by the veterinary authorities and its ultimate distribution, storage and use by the beekeeper. The classification of honey bees by the EU, rather disproportionately, as a food producing animals (FPA), in the same way as cows, sheep, poultry and fish, brings the full weight of the veterinary medicines rule book to bear on substances used to

medicate bee colonies. Through it, any substance be it oxalic acid, icing sugar or even talc, applied to honey bee colonies to modify their health will be classified as a medicine under the Veterinary Medicines Regulations (2005 et seq) thus requiring a marketing authorisation (MA) from the VMD.

The discovery, development and approval of medicines is a costly process. They must be shown to be safe and effective; quality is also important, which impacts production, distribution, storage and administration to the target species. This process costs hundreds of millions of pounds in the case of human and some veterinary medicines, a cost which acts as a huge disincentive to pharmaceutical companies in the development of medicines for a small, specialist sector such as beekeeping. Simply put, 'there ain't no money in it'; the market this size just will not support the development costs. The result is little 'research' effort on

management, which is no bad thing, but also to use unapproved substances, available locally or through importation.

This recognised paucity of approved honey bee medicines was the driver behind the recent workshop organised by the European Medicines Agency (formerly EMEA, now known as EMA) at its Canary Wharf headquarters in December 2009, entitled 'Medicines for Bees - What the EMEA can do to increase availability'. Seventy delegates gathered from throughout the EU; from the EMA itself and other national regulatory bodies e.g. VMD, academia, pharmaceutical companies, regulatory consultancies and beekeeping organisations including the BBKA, NBU and the British Honey Association. The key issues are touched upon below.

The problem of availability was defined as too few authorisations, complicated by the classification of honey bees as 'FPA's and the consequent need for MRLs to be

Small Hive Beetle and *Tropilaelaps* were held to be treatable with anti-varroa preparations, but given the inadequacy of current varroacides this approach seems simplistic! A lone view was expressed that we should be aiming to use fewer medicines, but was held as an aspiration rather than a reality. That just eleven substances in total are approved (i.e. hold MAs) across the EU but that on average, just three are available in any one country, is an indictment of the system and begs for urgent improvement. Easier registration for honey bee medicines might be facilitated under the MUMS regulations (Minor Uses - Minor Species). Automatic mutual recognition was proposed, i.e. an approval in any one EU country extending automatically to all member states, but this will require action at the Commission level, which takes time. Companies understandably complained of the costs and administrative workload in acquiring MAs and the additional cost of establishing MRLs, noting the lack of intellectual property protection to justify investment risk. All in all, this was an ambitious meeting intended from the start to define the problem rather than come up with solutions. This it did well and now the EMA and national authorities must work with the pharmaceutical industry and beekeepers to find a way forward.

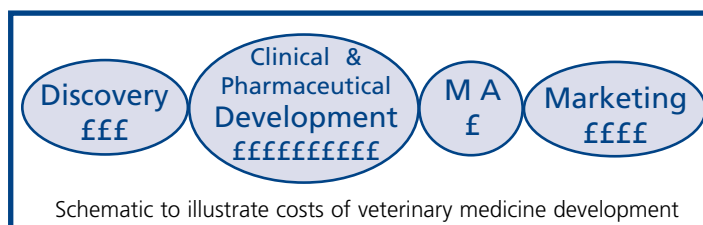
Against this backdrop of inadequate medicines availability future articles in this series will review the key legislation, the approval process, the veterinary 'cascade' system, provision of medicines, correct use and record keeping. We hope that you will find it helpful and look forward to comments and questions that arise.

Tim Lovett

A full report of the EMA meeting will appear on the EMA website in due course where the agenda and background document for this meeting can be found:

<http://www.emea.europa.eu/pdfs/conferenceflyers/bees/Agenda.pdf>

<http://www.emea.europa.eu/pdfs/conferenceflyers/bees/79432009en.pdf>



bee-specific medicines, rather companies 'develop' existing chemical substances for use as bee medicines e.g. the development of pyrethroid insecticides as miticides for varroa. The availability of bee medicines has been severely limited through these high development costs. We lack a universally effective varroacide and issues relating to safety, in particular the establishment of the all important maximum residue level (MRL), have rendered important substances such as fumagillin, a key agent for nosema treatment, technically (or strictly legally) unavailable in many countries. The limited range of medicines available to the beekeeper has hindered management of key disease threats and has had another effect in driving beekeepers to develop alternative approaches to disease

established for any substance to be authorised. The whole issue of residues is fundamental to bee medication, being influenced by the nature of the substances plus their method of application (e.g. dusting, trickling, vaporising, strips etc). Above all, producers and regulators wish to avoid residues in honey. There was lively critical comment on imports from outside the EU, use of antibiotics and the free availability of medicines in non-EU countries. The involvement of vets in the supply chain due to the need for FPA medicines to be VPOM (veterinary prescription only), both costly and clumsy, was noted and it was argued that better provision for the prescription and supply of medicines was needed.

There was fairly solid agreement on the key threats, namely varroa, nosema and foul brood diseases, but strangely less concern on viruses.

Mel Asks the Experts

A few years ago Mel started posing your questions to the 'experts'. The 'experts' are back ready to answer your questions so if you have a question please send it via the editor, whose contact details are on page 1.

In this issue Pat Allen from Essex BKA is answering two questions.

'Why does the temperament of a colony change just by requeening when the workers are not the daughters of that queen?'

I respond to this question with one of my own. 'Why would you be surprised that the temperament changes straight away?'

I suppose it depends on what you believe is responsible for the 'temperament' of a given colony. Is it the workers' genes that are the determining factor, or is it the pheromones that the queen produces, which we know do affect worker behaviour in many ways?

Well, even if the worker genes are the most influential factor, do not forget that genes can be affected by the environment; their effect is not set in stone at birth. On the other hand, if worker bee temperament is mostly determined by the queen pheromones, then we know that these vary between individual queens in both quality and quantity. Therefore, if we introduce a new queen to a colony, the pheromones then produced will have an immediate effect on the behaviour of the workers of the previous queen that are still present, hopefully to bring about improvement.

Although I confess that I am not familiar with the composition of queen pheromone and I would not want to be quizzed on which constituent does precisely what to a worker bee, nonetheless it has been my experience that in practice we do not have to wait until all the old queen's brood emerges and dies before a colony exhibits changed behaviour with the new queen.

To be anthropomorphic for a moment, it can seem analogous to when a new human boss joins an ailing organisation, and there is very often an immediate change to the 'atmosphere' in the place, which helps to lift everyone, improve attitudes and bring optimism. It may take a long while to right all the wrongs but people will begin to think positively, and work together towards the new goals.

'Why does the temperament of a colony change simply by moving the colony to a new site? Why does this happen and what influences it?'

There are many influences on the temperament of a colony – weather, availability of forage, queen quality, quality of their home, stress from the beekeeper or other frequent disturbance, bad siting of the hive (eg windy position), robbing, disease, etc. Some people believe that a colony can be affected adversely by overhead power lines but I have no experience of this.

If a colony is bad tempered, then it is often the older bees, the foragers, who are more 'touchy' than the house bees. Moving such a colony away whilst most of the foragers are out in the field, will leave flying bees behind and make it easier to inspect the combs and this is a good temporary measure which is better than avoiding carrying out a necessary inspection.

Where colony temperament is a continuing problem then the cause should be investigated and corrected accordingly, which may be by moving the colony or requeening or even removing the queen and uniting to another colony. Remember that a colony that continues to be unsatisfactory in temperament where there is no obvious cause should not be overwintered with its queen as she will produce new drones in the spring.

Mel

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Honey, Sugar and Bees

What are fructose, glucose and sucrose?

If it has got an –ose at the end it is a sugar – all sugars are carbohydrates. Carbohydrates are one of the macronutrients present in food – the others are proteins and fats.

All carbohydrates have the same caloric value – 4 cal/g.

Carbohydrates are present as simple sugars eg glucose, fructose or sucrose and bigger units like starch or fibre.

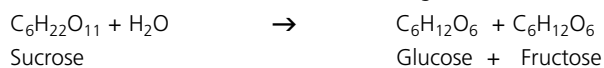
Our bodies have evolved to use carbohydrates as our main energy source. Glucose is the main energy source for our bodies – our brains only work on glucose.

Fructose, glucose and sucrose are all naturally present in fruit and vegetables.

Fructose and glucose are known as mono-saccharides – they have a single unit.

Sucrose has two subunits and is a disaccharide – it has one unit of glucose and one unit of fructose. Granulated sugar is pure sucrose derived from either sugar cane or sugar beet using simple water extraction and crystallisation.

Include chemical formulae for sucrose → glucose + fructose

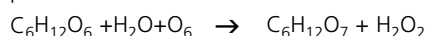


You will have noticed that glucose and fructose have the same number of carbon, hydrogen and oxygen atoms. All hexoses (6 carbon sugars) have the same molecular formula. The difference between them is how the atoms are arranged in space. This is called isomerism. Different isomers have different properties eg sweetness, solubility etc. The bees and your body can distinguish between these different sugars and have special enzymes to use them.

Honey bees collect nectar from flowers – nectar is a dilute solution of sucrose (80% water)

House bees convert the sucrose in nectar into a simple mixture of glucose and fructose using their naturally occurring enzymes – we use a similar enzyme to break down sucrose giving equal amounts of glucose and fructose.

In the process of converting nectar to honey other enzymes in the bees digestive system also break down glucose to gluconic acid and hydrogen peroxide.



These give honey its low pH- pH 3.2 – 4.5 and the hydrogen peroxide delivers some antimicrobial/antiseptic properties.

Honey contains typically 38% fructose and 31% glucose with a small amount 1% sucrose.

This ratio of fructose to glucose in honey provides a similar sweetness to sugar on a dry basis.

If you mix honey with sugar (sucrose) you can get an enhanced sweetness due to the sweetness synergy between sucrose and fructose.

Both sugar and honey are medium glycaemic index – sucrose = 65 GI;
Honey = 55GI.

Sugar is given to bees as a winter feed because it is exactly the same as the sugar in nectar.

Sugar Inversion and HMF

Sugar can be broken down into glucose and fructose to give what is known as invert syrup. Invert sugar gets its name from the old alchemists/chemists who noticed that the properties of sugar changed when it was heated with acid – notably the way the solution rotated the plane of a polarised light source. It inverted the sign hence invert sugar. However when sugars are heated at acid pHs not only do they invert to glucose and fructose but the reducing sugars (glucose and fructose) are broken down via a complex pathway to give colour and flavour. One of the major intermediates in the pathway is hydroxyl methyl furfural (HMF). HMF is known to be toxic to bees and can also be generated by overheating honey.

HMF can be generated when any mixture of sugars is heated at acid pHs – therefore sugar inverted with tartaric acid, Golden Syrup, acid produced glucose syrups can all be toxic to bees.

Sugar Manufacture Cane vs Beet; Brown vs White

Sugar (sucrose) is produced commercially from both sugar cane and sugar beet. Both processes involve water extraction of the plant material followed by concentration (evaporation) and crystallisation. Sulphur dioxide (SO_2) has been traditionally used to prevent colour formation in the evaporation stage of sugar manufacture. Small traces ($<10\text{ppm}$, typically 3- 4 ppm) have been present in all white granulated sugars for many decades. When you dissolve sugar to make a liquid feed the SO_2 is liberated into the atmosphere and the levels present are below the limits of detection.

Sugar crystallises naturally white and there is no difference between white granulated sugar from cane or beet.

The colours found in brown sugars are produced from breakdown of sugar in the manufacturing process. Brown sugars are only produced from cane processing and will contain appreciable levels of HMF hence they can be toxic to bees. SO₂ stops these colours forming when white sugar is crystallised.

Different sugars

All sugars are derived from granulated sugar.

Caster sugar is produced by simple sieving.

Icing sugar is produced by milling granulated sugar to a fine powder. Manufacturers add anti-caking agents to icing sugars to prevent them going lumpy and hard. The usual anti-caking agents are tri-calcium phosphate, cornflour or sodium aluminium silicate. They are only present at low levels 1 – 3%.

Diabetes and Sugar

Diabetes is a disease caused by faulty insulin. Insulin is used by the body to control glucose levels in the blood and transport glucose to where it is needed in the body. In diabetes this control system does not work effectively. Consuming sugar or honey does not cause diabetes. As both sugar and honey are medium glycaemic index sugars (honey = 55 GI; sucrose = 65 GI) they do not promote the same glycaemic response as glucose or starch. Diabetes UK advises that sucrose can be included in the diet for people with diabetes provided that it is used in the context of a healthy balanced diet.

*Dr Julian M Cooper, Head of Food Science. British Sugar plc
BSc Chemistry; PhD Carbohydrate Chemistry.
29 years in sugar research & food industry*

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The Insect Pollinator Initiative – Watch this Space

One of the major successes of BBKA's campaign for £8 million funding for honey bee health research came in the form of the announcement by Hilary Benn, Secretary of State at Defra, just a year ago that in addition to the £2.3 million to be provided to the NBU, £2.5 million would be committed to honey bee research.

This was later augmented by commitments from the Scottish Government, BBSRC, NERC and the Wellcome Trust, resulting in a total of £10.5 million, but this hybrid fund was no longer for honey bee health research having become a fund to investigate insect pollinator decline now called the Insect Pollinator Initiative. Clearly with all the problems facing bumble bees, moths, hover flies and the like, the fund would be inadequate to meet all needs, particularly the £8 million programme put forward by the BBKA.

The process of calling for bids started in summer 2009 and 'expressions of interest' (Eoi) were to be deposited with the fund by late September, with a view to those proposals favoured by the reviewers to be invited to be submitted by early 2010 with awards to be made by June 2010. Research is thus unlikely to begin before the 2011 beekeeping year, some two years after Mr Benn's initial announcement.

What we now know is that some 63 Eois were submitted with a value of some £52 million; clearly some weeding out has had to be undertaken and 33 projects valued at £25 million have gone forward to the full bid stage. The competition will be severe amongst these bids and despite the demands of both MPs and Peers plus the influential Public Accounts Committee calling for the lion's share of the fund to go to honey bee health research, the fund is giving no guarantees of this! In fact we know that no husbandry projects got past the Eoi stage which is serious, as these may well carry answers to our current disease related problems. There is a great risk, as we indicated in the past, that too much money will go on blue sky 'pure' research rather than on finding answers to existing problems through 'applied' research. We shall soon know more but the pessimism of some commentators seems to have some justification - watch this space!

*Tim Lovett
Immediate Past President*

A Bee on their Bonnets!

The BBKA is pleased to welcome New Holland Tractors as a corporate member.

The company, owned ultimately by FIAT Group, is one of the UK's leading suppliers of motive power for general agriculture and horticulture, producing specialist equipment for harvesting crops such as oil seed rape and also fruit farming. The aim is to raise awareness amongst farmers, landowners and contractors of the importance of bees and making provision for them in the stewardship of their land and the countryside. The provision of field margins, headlands and even apiary sites is to be encouraged. In addition to its corporate membership, New Holland will be making donations to the BBKA during 2010 for use in our educational and research activities. The BBKA will be present at a number of important agricultural shows during the year, starting with LAMMA 2010 (Lincolnshire Agricultural Machinery Manufacturers' Association) in January 2010.

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Economics of the Honey

Liquid Assets

The liquid asset for the honey bee is honey. Honey is the currency that is generated by the colony and expended in exchange for the necessities of honey bee life - energy, the raising of brood and the production of wax. In any economic analysis there are two sides, income and expenditure and for any viable system, biological, commercial or domestic, in the medium to long term the income must either equal or exceed expenditure. In our national affairs we have been recently reminded of the peril of failing to live by this rule and in the harsh natural world of a colony of honey bees such a failure leads to its death.

Expenditure, in broad terms, can be divided into two categories, overhead costs and the costs of production. Overhead costs are largely fixed and can only be altered over a period of time whereas costs of production relate directly to the level of production. So that in a company, the cost of maintaining a human resource department is an overhead cost, whereas the cost of buying the materials used in manufacture is a cost of production. In the honey bee world the cost of maintaining the hive environment is an overhead cost, whereas the cost of foraging is a cost of production. In a production scheme the gross margin is the difference between the value of the product over the cost of producing it. Like a household or a company, the colony can retrench and reduce overhead costs, though such retrenchment is rarely immediate. Beekeepers will observe that in times of dearth the colony will require that the queen reduce her rate of laying eggs and so reduce the cost of raising brood.

The Overheads of the Honey Bee Colony

There are a number of overhead costs that the honey bee colony must bear.

- The cost of raising brood.
- Metabolism of the colony adult population.
- Comb production.
- Winter stores.

- Costs of foraging for pollen.
- Cost of raising drones.
- Cost of raising new queens.
- Cost of foraging for water.

The first five of the fixed costs listed are the most significant and it is possible to estimate the costs involved by making a number of assumptions, which some who read this may disagree with.

Taking my reasonably strong colony, (56,000 adult bees and 31,500 brood) and using the following parameters:-

- The metabolism of a resting bee has a honey consumption of 0.875 mg honey / hr⁴.
- The cost to raise a new worker from egg to adult is 142mg of honey¹.
- Number of bees raised in one year = 150,000¹.
- The average life of a worker bee is 38 days.
- A colony of honey bee produces 2kg of wax per year.
- The annual cost of foraging for pollen is 38,000,000Joules⁽¹⁾.
- 1kg honey = 13,600,000J.

Therefore we have the following annual costs:-

- The cost of raising brood is 150,000 x 142 = 18,460,000mg = 21.3kg of honey.
- Metabolism of the adult population during the period from April to September = 150,000 x 38 x 24 x 0.875 = 119.7kg of honey⁵.
- Comb production = 2 x 6.25 = 12.5kg of honey.
- Winter stores = 18 kg of honey
- Cost of foraging for pollen = 2.8kg of honey.

This gives the total for the major overhead costs as 155.3kg (342lb) of honey.

On average the daily overhead during the winter is 18 / 180 = 0.1 kg of honey per day.

And on average the daily overhead during the summer is 137.3 / 180 = 0.76kg of honey per day.

The costs associated with producing honey have not been forgotten - they are taken account of in calculating the gross margin from foraging.

Bee Colony Part 2

The Income of the Honey Bee Colony

The honey is mainly produced by processing nectar, which is collected from the blossoms of flowering plants. During the summer, the majority of worker bees spend the final part of their life foraging, returning to the hive with loads of nectar. Some of the foraging bees bring back pollen and water but these are not being discussed here. The nectar is carried in the honey stomach, which is situated in the abdomen, and a worker can carry about 40mg of nectar. The sugar content of nectar varies enormously from 10% to 60%⁶. Even nectar derived from a given plant can vary considerably. For oil seed rape, a crop having nectar with a relatively high sugar content, the sugar content generally varies between 30% and 40%, and can be as high as 60%. In general the sugar content of the nectar of different plants is not well documented. As well as the type of plant, the sugar content and the amount of nectar available depend upon the weather and soil conditions. Plants with roots in damp soil will produce larger amounts of nectar than those in dry conditions, but the sugar content is dependent upon the amount of sunshine. A 40mg nectar load which has a sugar content of 40% will produce 20mg of honey. A 40mg nectar load which has a sugar content of 10% will produce 5mg of honey. To forage for a nectar load has a cost in energy. A flying bee consumes 14.5 mg of honey per hour. For foraging to be viable, each foraging trip needs to make a positive gross margin.

At this point I will again try to give substance to the argument with mathematics, but making estimates that I hope are justifiable if open to debate. I am going to consider again this reasonably strong colony of 56,000 adult bees, 26,500 of which are foragers⁷. Of these 25% will be foraging for pollen and therefore about 20,000 will be foraging for nectar. I will assume also that each forager makes eight trips per day, a total of $20000 \times 8 = 160,000$ foraging trips daily for the colony. In a

twelve hour day of sunshine there are 43,200 seconds and therefore this level of activity represents about four bees departing and returning every second, a level of activity that would indicate a colony energetically exploiting a nectar flow.

If the forage is yielding nectar with a 40% sugar content, the 40mg of nectar can be converted into 20mg of honey. If we now assume that the foraging trip takes half an hour, much of it spent flying; the cost of the energy consumed is 7.25mg of honey, giving a gross profit of 12.75mg of honey. For a nectar yielding 20% sugar content, the nectar can be converted into 10mg of honey and this would give a gross profit of 2.75mg of honey. In the first case, the daily gross profit from production would be $160,000 \times 12.75 \text{ mg} = 2.04\text{kg}$ of honey. In the second case, the gross profit from production would be $160,000 \times 2.75 \text{ mg} = 0.44\text{kg}$ of honey. With 40% sugar content, a weeks foraging produces a surplus, after subtracting average overheads, of $(2.04 - 0.76) \times 7 \text{ kg} = 9\text{kg}$ (19.8lb) of honey, or virtually filling a super, whereas when the nectar has a 20% sugar content the profit of foraging does not even meet the average overheads, and so the bees must utilise the honey surpluses previously amassed.

Conclusion

All this conforms to my observations of my own bees. Honey surpluses are usually gained in short periods when there is a nectar flow, and these can be followed by longer periods when honey stores change little or even reduce. Nectar flows occur when there are extensive areas of blossom to forage combined with a period of sunny weather, but during prolonged periods of mild but cloudy weather the bees can appear to be foraging with great energy but struggle to maintain or increase honey store levels. Periods of inclement weather when the bees are totally unable to forage result in continuing expenditure of overheads without any income and weak colonies can quickly deplete their available stores. In view of the large

Continued on Page 17

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BEEKEEPERS PROTECTIVE CLOTHING

Meet the Researchers

In this issue we have asked Giles Budge from the National Bee Unit to introduce himself and the work he does.



Let me get something straight from the offset, I am not a beekeeper nor is beekeeping in my blood. In fact, my grandfather owned a smallholding, on which he grew Brussels sprouts, and other nutritious seasonal vegetables. My father, had other ideas with land usage, and played his part in the re-landscaping of the Fens into the sprawling metropolis that we enjoy today! At the age of eleven, I went to the local grammar school and it was here that I experienced many formative events, including my first contact with beekeepers. This is the story of how it happened:

Miss Gent was our English teacher, progressive enough in her views to encourage children to talk freely about their extra curricular activities, in a bid to introduce the concept of public speaking. So picture the scene, a fresh faced youth with a keen mind, a sweet tooth, and considerably more hair than on display in recent years (see photo), sitting in a classroom considering what to bring to this 1980's version of show-and-tell. What could I bring to the floor to delight and amaze my peers? Well, as I recall, even at the age of twelve, it was all about instant impact; shock and awe tactics were the best way to boost playground credibility. So I dipped into my brother's extensive

collection of wartime memorabilia and when the day came, donned a full face gas mask and helmet. Once at the front of the class, I planned to stun and amaze by removing the pin from a diffused grenade. Sadly, however, my thunder was stolen by a lad called Chris, who as it happens, was the most unlikely of all usurpers. He rose from his seat dressed in what looked, to my youthful eyes at least, like the costume of an alien hunter, but was actually a white boiler suit with a veil. After part filling the room with eerie smoke from his smoker, he glided to the front to take the stage and steal the show. And thus, my earliest memory of beekeeping was formed; as a beekeeper you got to dress up and start fires - beekeeping was 'cool'.

I went to university not really knowing what to do, other than having an interest in science and a desire to experience life in the big city. As such, I chose to study Biology at the University of East Anglia, in Norwich. Norwich may not be your first choice for a 'big' city destination, but for me it represented twenty times more people per square kilometre than my place of birth! I studied under the watchful eye of Dr Ian Gibson who was Dean of Faculty for Biological Sciences; some of you may know Ian as a fervent supporter of the honey bee research campaign. Still searching for my *raison d'être*, I decided to take a year out in industry, and it is there that I found my purpose, applied science. My placement was split between working in a tissue typing laboratory in Colindale, another two fold increase in population by area, and more rural pursuits working at Horticulture Research International in Kirton. I graduated with a degree in Molecular Biology and Genetics, specialising in pathology, and was offered a job back at HRI Kirton as an assistance scientific officer. Despite spending a large

proportion of my time counting spots on Brussels sprouts to inform disease models, I managed to set up my first field trials in the summer of 1997. I was asked to produce red salad onions and establish which cultivated varieties of sweet potato were suitable for production in the UK climate, interesting stuff.

A year later I moved to work at a wonderful little research farm called ADAS Arthur Rickwood. It was there the real science began, looking at plant pathogen interactions with Dr Tim O'Neill, who was an inspirational boss, and is still one of the best regarded horticultural pathologists in the world. I spent four years working up integrated approaches to pathogen management in field and glasshouse crops before moving 'up north' to the Central Science Laboratory (CSL), since merged to form the Food and Environment Research Agency - Fera. My first few years at CSL were spent as a field based virologist, conducting trials on quarantine viruses of wheat (soil-borne wheat- and wheat spindle streak-mosaic viruses) and sugar beet (beet necrotic yellow vein virus aka rhizomania). I then moved into the laboratory to develop molecular tests for the viruses; work out which cultivars showed resistance; and then, in collaboration with National Institute of Agricultural Botany (NIAB), proceed to identify the genetic basis of resistance to provide diagnostic tests to plant breeders.

I studied for my Phd whilst working full time at CSL and completed my studies in three and a half years. My research was focused on understanding how a nasty plant pathogen, called *Rhizoctonia*, spread through the UK Brassica production industry. During my studies I developed multiple species-specific tests and methods to detect pathogens in large-scale environmental samples, like soil or water. These

methods later proved useful to monitor the spread of foot and mouth disease.

In 2007 I was brought into the National Bee Unit (NBU) with two main objectives. First, to collect scientific evidence to help beekeepers and bee inspectors do their respective jobs and to drive bee health policy. Second, by establishing university collaborations, to get more academics interested in working on honey bees. One thing about good science is that it takes time to build momentum and start to output interesting, robust results. Two years into my job, the NBU research programme is slowly gaining impetus, with seven postdoctoral studentships and research collaborations across the globe. We have helped to obtain funding on honey bee research from BBSRC and NERC research councils, not for our benefit, but to benefit beekeeping. You may notice from my penned curriculum vitae, I love science, but only if it has a purpose. Yes high science is interesting, but unless it has real world application, it fails to hold my attention and I am left asking 'what was the point?' As I said earlier, I am not a beekeeper, but honey bee research does not need another beekeeper. My skills are complemented perfectly by the others in the team within which I operate, to provide an integrated service that the members of the NBU are proud to be part of.

What of the future of honey bee research at the NBU? Well, we are involved in one fifth of the bids that made it through to the second round of the Insect Pollinator Initiative, which is good news for beekeepers because all of our applications try to improve or inform beekeeping practices in some way shape or form. In teaming up with academics we hope exciting times are ahead for honey bee research. To coin a phrase 'the future's bright, the future's yellow and black!'

Dr Giles Budge

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Virus Infection and Colony Collapse Disorder

Ian Jones, Professor of Virology at the University of Reading, puts the current field in context and describes his own work on bee viruses.

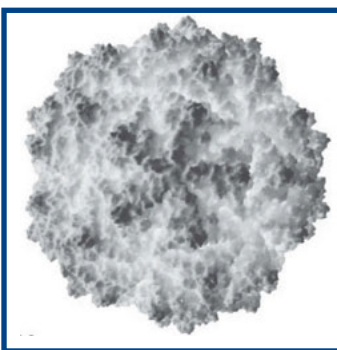
Bees are our most loved of social insects. Everybody from child to grandma knows of swarms and hives, of waggle dances and stings, of queens and workers.

The life of the honey bee is portrayed as one of virtue, a lifelong toil to be appreciated, nurtured even mimicked. But there is a darker side to the gathering together of many insects, indeed of any large congregation of organisms, in that it provides the opportunity for the easy spread of infection between individuals. And one class of infectious agents stands out from the crowd in their ability to appear as if from nowhere, to spread rapidly and to cause high levels of morbidity and mortality; the viruses. Viruses are the chancers of the biological world, the spread betters of evolution. If an opportunity to infect a new species arises through the presence of large numbers of susceptible hosts then it is only a matter of time before a virus will seize it and move in to begin the colonisation process. It is not a matter of choice, it is Darwinian selection in action for what viruses lack in guile they overcome by numbers, changing and adapting at every generation to become more suited to the hosts they invade. It is a repeated story with examples across the biological world, some natural like the

influenza pandemic from which we are currently suffering, some stirred up by intensive rearing for economic gain, fish farming, which now has a number of hitherto unknown virus infections, being a good example.

So it should come as no surprise that honey bees have a number of viruses associated with them. Diseases of the brood stock have been known since the mid 19th century (Alessandro Baricco's novel 'Silk' describes similar diseases in the silkworm industry caused, curiously enough, by related viruses) but that the causative agents included viruses is more recent. Today their names leave no doubt of the link; acute bee paralysis virus (ABPV), deformed wing virus (DWV), sacbrood virus (SBV) and Kashmir bee virus (KBV) amongst others. It is also not surprising that viruses should have been linked before now to Colony Collapse Disorder (CCD) although other causes, particularly varroa infestation and pesticide use, were also in the frame. A strong case for a virus at the heart of CCD arose in 2007 when American researchers used a new form of analysis, metagenomics, to investigate the total spectrum of biological life associated with hives that were either healthy or suffering from CCD. Of a number of agents identified there was a statistically significant link between the occurrence of a new bee virus, Israeli acute paralysis virus (IAPV), and the occurrence of CCD. Hailed as a breakthrough at the time, and

certainly a major advance, the link between IAPV and CCD has since been questioned as there continue to be cases of CCD that seem not to be attributable to IAPV.



An atomic resolution picture of Black Beetle virus, a relative of Israeli Acute Paralysis Virus. The virus is 25 nanometres in diameter and is made of repeating subunits which give it a distinct symmetry. About 500,000 viruses would be present per bee in an active infection.

IAPV was isolated first in Israel in 2007 but is already to be found in the Americas and Europe. It is closely related to Kashmir Bee Virus (KBV) but as a new virus relatively little is known about its particular effects on bees following infection. There is little doubt that it will be deleterious but whether it is enough on its own to cause bee loss or needs an accentuating factor is one of the many questions that need to be addressed. One such factor is varroa infestation whose role is complex as the mite too can be infected by the same viruses. Is varroa only the vector by which viruses are transmitted or does it act as an amplifying host enabling bee viruses to reach levels that then pose a threat to the colony. In

the case of Deformed Wing Virus (DWV) it has recently been shown that carriage by varroa is essential for the virus to cause overt disease in the bee. This is in addition to the weakening of the brood by the mite constantly feeding on pupae. It is a tangled web of interaction and dedicated study of the individual agents is required before a complete 'who caused what' explanation for colony loss can be derived. When it comes, suggestions for the best measures of control should then follow.

In this light the BBSRC have recently funded my group at the University of Reading to work on IAPV directly. We are interested in the molecular aspects of the virus and in addressing its effects when introduced into otherwise healthy bees. There are several strains of IAPV known, do they differ in their infection outcome and if not what is the purpose of the variability. The analysis we propose will also produce a number of reagents that will be useful for the generation of a simple diagnostic test for virus presence and we will be pursuing this in partnership with the NBU in York.

As noted, virus emergence is common enough but why IAPV should crop up now and what its real relationship is to varroa and CCD is not at all clear. Our studies should help fill in some of the gaps and allow us to get one step ahead of this emerging disease and its consequences for the honey bee.

Ian Jones, Professor of Virology, University of Reading

Economics of the Honey Bee Colony Part 2 ...cont

overhead costs and the unpredictable variability of the income it is not surprising that honey bees, when they can, will amass a great surplus of honey. This surplus is not just for the current year but gives a back up for future years of possible dearth. If we harvest honey then we must expect in many areas to have to feed our bees, not necessarily every year, but over the longer term. It is the uncertainty and economic insecurity that have been the evolutionary drivers in producing our industrious honey bee.

Final Note

In the above I have tried, mainly to further my own understanding, to create a simplified mathematical model of the economics of the honey bee colony. The important word to note is 'model'. The degree to which the model can be likened to the real colony is prejudiced not just by the over simplifications but also by the different values for the parameters that are available from different sources. But it gave me satisfaction that, despite all the approximations, the model can be seen to relate to the real thing. My most important source of

information was Honey Bee Ecology by Thomas D Seeley, which I would recommend to anyone interested in furthering their understanding of the evolution, ecology and energetics of the honey bee.

John Whitaker

Barkston Ash BKA, Yorkshire

References:

- [1] T D Seeley – Honey Ecology
- [2] The cell area (27.65sq mm) is the result of my own calculation, derived from measuring the average cell diameter across my own brood comb. Seeley [1] gives 23.87sq mm.
- [3] Winston gives a wide range for the number of days a worker bee may live, averaging around 38 days. This would

imply that, on average, the adult population is $38/21 = 1.8$ times greater than the amount of brood. It is thought that the life of a forager is limited by the distance it is required to fly, the maximum possible being about 500miles

[4] Winston – The Biology of the Honey Bee

[5] A better model of the total metabolism would take into account that the metabolic rate of a colony varies significantly, depending on the ambient temperature, having a minimum at 11degree C and a maximum at 17 degree C. The maximum rate is three times the minimum rate. [1]

[6] Allan Calder – Oilseed Rape and Bees

[7] The 26,500 foragers in the 56,000 bee colony is derived by assuming that bees start to forage at 21 days of age and continue until they die at 38 days, so that $18/38$ (47%) of the adult bee population are foragers.

News from the National Bee Unit

Bee Husbandry Survey

Honey bees are subject to infection and/or infestation by various bacteria, viruses, and parasites. Each of these agents, to a greater or lesser extent, can have an impact on the strength and productivity of an affected hive. However, the overall health of a colony and the likelihood that it will survive and prosper, are not simply matters of whether or not any particular pest or pathogen is present.

Common sense tells us that the ability of a colony to thrive is affected by many other things such as nutritional status, local climate and, of course, the way in which bees are managed. This 'picture of health' is further complicated by the fact that such influencing factors are not independent, but interact with each other to create circumstances more or less conducive to honey bee survival.

To properly understand the relationship between apiculture practices and ultimate colony condition, we need to compile firm facts about not just incidence of disease, but also a variety of aspects of colony management. Such consistent data about beekeeping practices in the UK has been lacking. For these reasons, in 2009 the NBU launched its first annual national bee husbandry survey. Ultimately, data obtained will compliment that gathered through other surveys compiling beekeeping statistics, by providing a comprehensive assessment of current beekeeping practices in England and Wales.

The NBU husbandry survey poses thirteen key questions about beekeeping, and is open to all beekeepers in England and Wales. To reach as many people as possible, and to make the survey as random as possible, it is distributed in different ways. Sometimes paper copies are offered to beekeepers by inspectors during apiary visits, others are made available at training events, but most tend to be completed online by beekeepers accessing the survey through BeeBase. In all cases responses have been voluntary. Almost 1,700 questionnaires have been completed. Preliminary analysis of responses are summarised below:

- We have obtained useful information about beekeeping

practices from 57 counties. The greatest proportion of beekeepers who have responded so far, keep their bees in North Yorkshire (~6%), although comparable levels of response have also been obtained from Dyfed, Norfolk, and Lincolnshire.

- The average length of time for which respondents have kept bees is fourteen years. However, the most typical response is just one year. Expressed as a percentage, the proportion of respondents who are new to beekeeping (i.e. who have been keeping bees for two or less years) is 21%. Nevertheless, the community also includes a fair proportion (14%) of extremely experienced practitioners, who have kept bees for over thirty years. Many respondents (43%) maintain less than thirty colonies, with most (56%) having between one and four hives, confirming that in England and Wales, beekeeping is generally undertaken on a comparatively small scale.
- A minority of beekeepers (15%) move their bees during the year for the purposes of, for example, apple pollination.
- Regarding the use of imported queen bees, almost all respondents (98%) utilise queens of UK origin (obtained either through commercial breeders, own-rearing, or by natural replacement by bees). However, some beekeepers (8.6%) also import queens from elsewhere. Most imports are EU origin; non-EU sources include Hawaii, New Zealand and Australia (0.4%).
- Three quarters of respondents monitor for varroa.
- 95% of respondents treat for varroa. To capture information about management practices, the survey records incidence of use of seventeen control methods, including a range of varroacides (pesticides, acid solutions) as well as biotechnical means (drone comb removal). Those who treat for varroa generally choose to apply Apiguard (61%), usually administered between August and October. Common supplementary methods include applications of oxalic acid (self- or pre-mixed) (41%), and open mesh floor (41%), dusting with icing sugar/ground rice (22%)

and drone comb removal (21%).

- Regarding general husbandry, 83% of respondents replace at least one comb with new foundation each spring, and 87% feed their colonies with at least one form of supplement. The most widely used is sugar, followed by Ambrosia (86% and 53%, respectively). Sugar is given throughout the year, but generally towards the end of the beekeeping season (peak applications in September and October: 67% and 44% respondents respectively). Further feeding may also be carried out in late spring (e.g. March, 24% respondents), to support newly emerging bees. It would not be usual practice to provide supplemental feeding during a good summer. However, these responses reflect the fact that colonies should be checked regularly in times of dearth, and provided with nutritional support as needed.
- At the time of answering the survey, almost half of respondents (48%) believed their bees to be disease free. Just less than 2% perceive that their bees have acarine, 18% perceive infection with nosema, 43% suspect infection with chalkbrood, and 3.5% consider that sacbrood is present in their hive(s). Note, however, that the above diseases are not notifiable, which means that beekeepers would not necessarily invite an inspector to visit, or seek formal diagnosis. Interestingly, of those who have had their bees screened for disease agents during the year, almost 5% have actually been diagnosed as positive for acarine, and nearly 38% are positive for nosema. At face value, such data suggest some discrepancies between disease perception (and possibly the need to intervene with treatment), and actual incidence of infection.
- In terms of incidence of notifiable diseases requiring statutory intervention, 9.5% of respondents had been diagnosed with European foulbrood, and 1.6% were confirmed positive for American foulbrood.
- Twenty one percent of respondents treat for nosema with Fumidil-B.

- Just under half of respondents (49%) reported that they did not lose any of their colonies over the winter of 2008/09 but 4% stated that they lost all their colonies.

- When considering the proportion of changes (losses or gains) in colony numbers between September 2008 - April 2009, there was an overall fall of 13.8%. It is important to note that this colony loss figure has been obtained not by averaging losses at the apiary level as presented by individual respondents, but by calculating the overall percentage changes in colony numbers across all colonies and counties. This gives a fairer picture of colony losses, as otherwise a beekeeper that had one colony and lost it would be recorded as 100% loss; equally, if he/she obtained just one more hive, this would be a 100% gain; on the other hand, if a beekeeper with fifty colonies loses, this would be recorded as a 2% loss. Given that so many survey-respondents have only one or two colonies, if their individual changes (losses or gains) were averaged, this could potentially alter (artificially inflate or deflate) losses by several percents. Information from the husbandry survey will be fed into COLOSS, the international network for prevention of Colony Losses.

The survey is closed for 2009, but further data analysis is exploring the complex interactions between husbandry practices and colony condition in the UK. If you did not get a chance to fill in the questionnaire this season, we encourage you to take part next year. The survey recommences in May 2010. We intend to gather data annually and will continue to monitor trends in UK beekeeping. We gratefully acknowledge the help of all of those who have taken the time to complete the survey. You have made a really important contribution to apiculture research.

If you would like more information about the Husbandry Survey, and/or the National Bee Unit, we encourage you to visit BeeBase, which is regularly updated with news about our research activities:

www.nationalbeeunit.com

*Gay Marris, Science Writer,
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Honey Bees, Bumblebees and Diseases

The diseases and parasites of honey bees have been well studied, although the recent outbreaks of colony collapse disorder demonstrates that there is much that we still do not understand about honey bee health.

In contrast, far less is known about the diseases that infect other bee species such as bumblebees. In particular, the viruses found in wild bee species have hardly been studied at all, so that we do not know what types of virus infect them, what impact they might have, or what their geographic distributions might be. In recent years it has become apparent that wild animals can act

as hosts for serious diseases of livestock and humans, such as bird flu and rabies.

The same may be true of bees, with wild bees such as bumblebees exchanging diseases with domestic honey bees and domestic bumblebees used in glasshouses, but there is very little evidence one way or the other.

The African honey bee parasite *Aethina tumida* (small hive beetle) recently invaded North America, Egypt and Australia, and has been found to successfully attack nests of the north American bumblebee *Bombus impatiens* colonies where it causes considerable damage.

Deformed wing virus, a viral disease of honey bees, has been

found in commercial colonies of the buff-tailed bumblebee *Bombus terrestris* in Europe, transmitted between the two species as a result of the practice of placing honey bees with bumblebee queens to help induce colony founding. This virus has also been found in a wild colony of the common carder bumblebee *Bombus pascuorum* which had been robbing honey from a honey bee hive.

It seems likely that many of the viruses known from honey bees also occur in bumblebees and perhaps in some of the many hundreds of species of solitary bee, but no one has yet looked. It may be that some 'honey bee'

viruses are primarily diseases of wild bee species that occasionally spread into domestic honey bee hives - we do not know.

If we are to look after the health of honey bees and also that of wild pollinators, it is vitally important that we find out more about which diseases occur in wild bees such as bumblebees, and how easily they spread between bee species.

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Natural Beekeeping Discussion Day

Bees for Development works at the heart of a global network of beekeepers.

Through our work we have gained unique insights into the many different ways people interact with and care for honey bees. This global perspective presents us with a picture of where beekeeping is practised sustainably, and where it is not.

This year we have felt motivated to broaden the scope of our network and, unusually for us, come closer to home. We are often approached by people in the UK who are interested in bees from a nature conservation view point, drawn to us because of our familiarity with 'close to nature' approaches to beekeeping practised in developing countries. Interestingly, in Africa, beekeepers practice 'close to nature' beekeeping because they have no means to control environmental factors. This contrasts with the situation here in the UK, where we and our bees are living in a manicured environment. In the UK the motivation is consideration for the welfare and survival of the honey bee. Yet it is fascinating to reflect that African 'close to nature' approaches to beekeeping appear to be responsible for the fact that Africa is the last place in the world with extensive populations of healthy, indigenous *Apis mellifera* bees (Dietemann *et al.*).

In July 2009, Bees for Development held a Discussion Day on Sustainable Beekeeping, with people interested in natural beekeeping in the UK. The purpose of the meeting was to share knowledge and experience, discuss ideas about sustainability, and learn about our various approaches.

To guide discussions, we considered three aspects of sustainability:

- The environment in which bees live, feed and reproduce
- Genetics of the honey bee population
- Apiary methods and approaches

Discussions about the environment were the least controversial and are likely to coincide with the vast majority of beekeepers everywhere i.e. bees need access to diverse, uncontaminated floral resources. We added to this that it is important for bees to have nesting sites in the environment, for wild colonies. This brought us to a discussion about the UK honey bee population as a whole and here participants recognised that restoration of the wild honey bee population is an important part of any UK approach to sustainability. It was agreed that local adaptation and adaptability are key to genetic fitness, resilience and health, but participants differed on the extent to which the process can be left to

the forces of natural selection, as opposed to the human forces of beekeeper selection. Participants were united in their opposition to the importation of queens, as this practice interferes with the process of local adaptation, and is considered non-sustainable.

The subject of colony management and beekeeping methods are where we see the greatest departure between 'natural beekeepers' and 'conventional beekeepers'. Although there is no standard set of rules for natural beekeeping, the general principles favour a management approach which respects, as closely as possible, the natural life cycle and processes of the honey bee. The basis for this view is that human interventions tend to cause stress to the bees, and this reduces their vigour and has impact on their immune systems. Most natural beekeepers therefore believe in allowing bees to build their own comb, allowing the queen access to every part of the colony and avoiding, as far as possible, breaking open the brood

nest for any intervention or manipulation. Other views on management are a question of degree and will be familiar to many conventional beekeepers, for example, always leaving enough honey for the winter and not feeding sugar.

The discussion day ended with all participants agreeing that the subject of natural beekeeping is a growing interest area within the UK. Acceptance of this approach depends on proponents being willing to share and discuss their experiences and ideas.

Further reading

A record of the Discussion Day is available on the Bees for Development website - <http://www.beesfordevelopment.org/intheuk>
Natural beekeeping forum - www.biobees.com
Demeter beekeeping - www.biodynamic.org.uk/farming-and-gardening/bees.html

References

Dietemann, V., Pirk, C.W.W. and Crewe, R. (2009) Is there a need for conservation of honeybees in Africa? *Apidologie* 40 (3) 285-295

BfD Beekeepers Safaris 2010

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Details at www.beesfordevelopment.org

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Field Testing – Your Opportunity to Help

Novel bee food product to be field tested in the UK and we need your assistance.....

Honey bees and beekeepers need aids to contend with the long list of present adversities to healthy robust bee colonies. Honey bees are suffering from habitat loss, loss of biodiversity, possible impacts from use of agro-chemicals and bad weather conditions. Weakness caused by a combination of factors makes the colonies more susceptible to diseases. Optimal feeding as part of good bee husbandry, enabling colonies to cope under these difficult circumstances is very important.

International research is taking place, examining the causes of bee colony losses. This research into causes will hopefully lead to long term solutions, although the problems are very complex and therefore real integrated solutions seem far away. In the quest for

survival, any aids which can help the bees increase their health, thereby strengthening their immunity to disease in the short term, are welcome as soon as possible.

A natural sustainable bee food product is available now. It has unique properties designed by nature to support the immune system. The product requires field testing with honey bees before being able to make it available. We propose to conduct a field trial in the UK utilising the expertise that competent beekeepers have in working with their bees. Beekeepers need a proven product which is well documented, easy to use and also can fit into their tight beekeeping budget. We are willing to take on this challenge, but cannot do it without your assistance!

The product is a natural plant

product. It is safe to use and has proven itself in many other situations including human and animal health. It is truly unique to beekeeping and has never been available to beekeepers until now. The company manufacturing the product is situated in the UK and has many years of expertise concerning its use. We envisage that the product will be particularly supportive to the bees concerning their requirement for protein when insufficient protein is available from pollen.

At this stage of preparation we cannot publicise product details. For trial purposes, it is called API-X. Naturally, when you take part in the trial further details will be revealed in confidence. We wish to contact competent professional or amateur beekeepers with a minimum of six hives (per location) with one or more

locations available with which you would be willing to participate. Only some of the hives will take part in the trial. Comparable hives are necessary to be able to register effects of using the product. Participants will be provided with the product free of charge in return for careful use, monitoring and reporting of the results.

Interested to participating? Please send your name, address and telephone/e-mail details to:-

By post: Waverlex Ltd, Project API-X, Half House, Military Road, Rye, East Sussex TN31 7NY

By e-mail: nopex@themutual.net

We will contact you to inform you further regarding the trial. We are looking forward to working together to put an invaluable bee aid on the market.

Christine De Mulder MIEEx (Grad)
GoalXport - for and on behalf of Waverlex Ltd., UK

ApiLifeVar® is now available in the UK

Chemicals Laif, the manufacturers of ApilifeVar have provided the following information which they feel will be of interest to readers of BBKA News.

We are pleased to inform you that our product ApiLifeVar®, an organic medicine against varroa, has been recently authorised for the UK market (Marketing Authorisation Number 23101/400).

ApiLifeVar® is the first organic product based on essential oils to be developed for the fight against the varroa mite on honey bees and is backed by more than fifteen years experience. ApiLifeVar® contains four active ingredients: Thymol, Eucalyptus Oil, Menthol and Camphor; Thymol being the one with the higher concentration. This special mixture allows a proper and complete evaporation of the active ingredients inside the beehive even when the external temperature is lower than the seasonal average.

Effectiveness and Reliability: Experience over many years using the product as well as numerous studies carried out in Italy and elsewhere prove the high effectiveness of API LIFE VAR® showing an average varroa mite drop of higher than 90%.

When to Use: For maximum efficacy use the product in late summer after the honey harvest; having removed the supers.

Temperature: The ideal outside temperature for a good effectiveness of the product during the treatment ranges between 20-25°C. Insufficient efficacy can be expected if the average outside temperature is lower than 15°C.

Special Advice:

- All colonies in the same apiary should be treated simultaneously to avoid robbery.
- Do not place the strip in the centre of the beehive or near the brood.
- Treat by introducing the product into the beehive either early in the morning or late in the afternoon towards sunset.
- No eke is required for the treatment.

Method of Administration: Dosage: One strip for each beehive (broken into two or four parts and placed in the corners of the beehive) every seven days for four weeks. Complete treatment: four strips for each beehive. In this kind of pharmaceutical form ApiLifeVar® is perfectly adaptable to the degree of varroa infestation, temperature and type of beehive.

ApiLifeVar® is now available on the market and distributed throughout the country by all major UK suppliers. For further information contact Chemicals Laif Tel: 0039 049 626281 Fax: 0039 049 628501 www.chemicalslaif.it - info@chemicalslaif.it

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Local Queen Rearing Programme

The Bee Improvement and Bee Breeders Association (BIBBA) are offering to help beekeepers to rear queens from bees that suit their particular area rather than use imported queens that may not be as suitable.

BBKA has a policy of discouraging the use of imported bees and queens. There is concern about the possibility of the introduction of pests and diseases as well as the unsuitability of bees that have not evolved to suit our conditions. Many people who have recently come into beekeeping have specifically asked for locally bred bees and queens and there seems to be a genuine desire to avoid imports.

There are many beekeepers, even reasonably experienced ones, having only kept bees in one area who think that all bees are the same but different geographical areas need bees with different characteristics due to such things as weather conditions or available forage, e.g. the bees that are in an

oil seed rape area will need a the characteristic of building up strongly in the spring, unlike the bees in a heather district. The bees that would naturally live in East Anglia, Pembroke, Tipperary, Belfast or Thurso need different characteristics in order to survive. Although we are not dealing with a natural situation, bees that are unsuited to the locality will need a lot more looking after than those that have been adapted to it and they may not be so productive.

The bees that are native to these parts are the dark north European honey bee *Apis mellifera mellifera*, and these have different ecotypes that suit the locality in which they have to survive. For that reason it is unreasonable to expect an exotic race such as Italians bred in New Zealand or Hawaii to perform well in their new environment in the UK and that is probably the reason for many failures. Unfortunately, without realising this fact, failures are often replaced with more of the same.

The Local Queen Programme

is being set up to encourage beekeepers to raise their own queens from the best that is available locally and through constant selection to develop a bee that suits their own circumstances. It can be achieved in a number of ways, but it is hoped that local BKAs will play a major part. The vast majority of beekeepers only have a few hives and it is difficult for them to improve their bees on their own, but a local BKA is already in existence and it is much easier to obtain good results in a group situation, either with a larger number of colonies or by widening the scope of a teaching apiary where queen rearing can be a useful addition.

The ultimate aim is a pyramid system with member beekeepers at the base, and both them and the local BKA doing the propagating of queens. It may be that local breeding groups dealing with the more technical details of queen breeding will be formed by those wishing to learn more about

this important and interesting aspect of beekeeping. Where a breeding group exists it may be possible for them to do the selection and raising of breeder queens that can be supplied to local BKAs for raising queens for their members. It is entirely up to local BKAs how they deal with it, but BIBBA are willing and able to help in a number of ways. There will be information on the BIBBA website, and tuition and lectures can be arranged.

BIBBA do not want to tell Beekeeping Associations or beekeepers what to do, but they are willing and able to help with advice if needed. Different people will have different ways of doing things and it is to be expected that each BKA will have a different situation or need.

If you or your BKA are interested in finding out more then please visit http://bibba.com/local_queens.php or contact Roger Patterson on 01403 790 637 or 07976 306 492 for further details.

Roger Patterson, BIBBA



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Education

The Healthy Hive[©] Guide

Gold Medal winner in the Apimondia 2009 Multi-Media competition, this new educational resource is a breakthrough in helping new and improving beekeepers spot early signs of trouble in their hives and what actions they may have to take to help eradicate or prevent a recurrence.

Designed for easy use in an Apiary environment, this 48 page photographic reference book uses FSC approved papers together with a bio-degradable matt film lamination. This informative guide is sure to be a welcome addition to the beekeeper's library.

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Poor Performance of Queens

For some time now I have been highlighting problems with queens which include early supersedure and queens 'disappearing'.

I have written many articles and lectured widely on the subject, recently at the FIBKA Summer School at Gormanston, where there were many beekeepers who had experienced exactly the same things I had described. There are many references in the Bee Press from around the world although I am not convinced they all have the same cause.

Early Supersedure - Supersedure naturally happens with older queens towards the end of the season. What is regularly happening now is that many queens are being superseded soon after they commence laying, and often before the first brood is sealed. It is not uncommon to have several queens heading a colony throughout the season, but this is missed by many beekeepers, especially if they do not mark their queens.

Queens 'disappearing' - This is happening too often for the possibility of damage during manipulation and records usually show this not to be the case. In my experience there are emergency cells built in only about 50% of cases, suggesting that where none are built the queen probably goes off lay several days before 'disappearing'.

There are many beekeepers who have not seen any problems, but I have experienced them for around eight years now and probably look at colonies much closer than most. Some beekeepers are very dismissive and look for what appear to be obvious reasons such as bad weather. In my experience the weather is more bee friendly now than at any time in my beekeeping career and many of the problems occur when the weather is perfect for mating.

The loss of feral colonies is often blamed for poor mating but I doubt if that is the reason. There are several places where there are few colonies and their queens get mated and perform well. I have an open mind on anecdotal evidence, but it does seem that in the remoter parts queens seem to be performing the same as they always have.

There are problems in seeking research for a number of reasons

which I think is a pity. In my view this is very important. A high percentage of my recent winter losses have been colonies where there have been queen problems in late summer or autumn.

I have always taken the attitude that I am a practical beekeeper and all I will do is highlight the problems and rely on experts to deal with finding the answers. As I am not qualified to do so, I have not publicly said what I think could be causing the problems, but in the absence of positive moves I will now list those I think are worth investigation.

I am involved with around 150 colonies which I think is a reasonable sample. Not long ago it was common for queens, especially native types, to live four or five years, but now it is quite uncommon to have a queen that has lasted two years.

I have witnessed many colonies with problems and it is my belief there is more than one cause and could be multiple causes and combinations. It could well be that one symptom has one cause in one area and another elsewhere, and this I think will make research difficult as so many disciplines may be involved.

Pesticides - These are now much more sophisticated than they were. Could it be that sub-lethal doses are getting back to the hive and as queens live much longer than workers and are only fed from within the hive there is a chemical build up in their bodies?

Hive treatments - Although there are less hard chemicals used than there were, there could be residues in wax, especially as some is imported from countries that use chemicals not registered here. I have made foundation for over forty years, and am currently using wax that was harvested in excess of twenty years ago, although many of the hives I deal with use commercial foundation. There are the same problems in both groups of hives.

Varroa - This is an obvious culprit and is currently a major area of research although probably not regarding queen performance.

Viruses - Many are vectored by varroa giving a much higher level than would occur naturally.

Drone viability - It is known that drones that are parasitized by varroa and exposed to some treatments are affected. This may

explain early supersedure, but I am not sure about 'disappearing'. This could be easily tested by comparing drones from areas with varroa to drones from areas without. Of course different colonies have different varroa levels and in open mating situations there is no control over the drones. I know the varroa levels in many of the colonies in which I am involved are low, and I suspect are good in my area.

Mobile telephone masts - Yes, I know everyone keeps laughing at this one and dismissing it, but that seems to be based on research that was discredited and the researchers protested at the way their findings were interpreted. I suspect there has been other work done that is helpful.

Nosema - It is known that queens infected with nosema are often superseded early. I suspect *Nosema apis* is not much of a problem as that has been with us a long time, but *Nosema ceranae* has only recently arrived. We do not know how long it has been here, but I understand it was in the USA twenty years before it was

detected, so the same could have happened here. The timing works out about right, and I believe this may be high up the list of culprits. This could be easy for beekeepers to test for, and the technique has been used for a long time. The queen is removed from the hive and confined for about an hour during which time she will have defecated, and can be returned. Queen faeces are clear and can be inspected under a microscope in the normal way. Details can be found on <http://www.ars.usda.gov/is/np/honeybeediseases/honeybeediseases.pdf>. Perhaps there are beekeepers who can monitor in their own areas. It appears to be difficult to tell the difference between *Nosema apis* and *Nosema ceranae* under a microscope and this may need addressing, but at the moment I think it would probably be sufficient to say whether a sample is positive or negative for nosema. This then brings up another question at what level is nosema in queens likely to be a problem and how do we get that information readily available. It seems this could be a good area to be researched.

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Poor Performance of Queens ...cont

Pheromones - As well as the problems with queen performance I have noticed several other unexpected things happen within a hive. In June 2009 I witnessed four colonies within two weeks with about 50% swarm cells and 50% emergency cells in the same hive. These were all full colonies, but at different locations. They were all in the right state for swarming, but why the emergency cells? To me there were two different messages given to the bees, both pheromone driven. For some time I have seen other things happen that I think were pheromone related, and it gave me an idea that perhaps they were being 'interfered' with in some way. I am an engineer, not a scientist, so try to work things out by observation and logic. In simple terms I see pheromones as chemical compounds that are made up from elements that are present in certain ratios, and my thinking is that perhaps some of the chemicals that are in the hive in very small doses may be reacting with these elements, and either altering the quantity or knocking them out altogether, giving the bees the wrong message. I have passed this idea by several people who are far more knowledgeable than me, and to my surprise nobody has

jumped on me yet. I think this area is well worth researching.

Nutrition - This could be larvae and adult, both of which are probably controlled by pheromones. I have no proof, but it seems to me there is often not the residual royal jelly left in queen cells after they have emerged a there used to be. If pheromones are not functioning properly perhaps the larvae are not being fed enough.

I wish to make it clear I am not saying any of the above are causes; just areas that I think could be researched. In my own case I have been managing my bees in a very similar way since 1963, so it is unlikely I am doing anything to cause the problems.

Anecdotally I have been told of many failures with imported queens, and these are likely to have been produced by professionals in much better climates. Of course it may be the causes are different than ours, but it does seem the problems are very widespread.

For those who have experienced the problems and need advice on dealing with their colonies I have written a help sheet <http://www.wgbka.org.uk/WGBKAdocs/QM%20Leaflet.pdf>

*Roger Patterson,
West Sussex BKA*

The EARS Project Takes Off!

Ricarda (Ricky) Kather, the Eastern Associations' Research Studentship (EARS) student has started work on her four year doctorate on 'The Effect of Varroa Mite Viral Diseases on the Honey Bee Recognition System'.

The Eastern Region Beekeepers' Forum is working together with the National Bee Unit and Sheffield University on this project which is grant funded by the Biotechnology and Biological Sciences Research Council (£80,000) and the Eastern Beekeepers' Forum (£16,000). Ricky is working in the new Arthur Willis Environment Centre, Sheffield University producing a

list of experiments to be carried out. She wants to discover how varroa mites adapt themselves to particular honey bee colonies and avoid detection. She also wants to discover whether the mites use their own chemistry to mimic the colony's recognition chemicals, or use the bees' own substances. To discover how the bees produce the recognition materials it is proposed to 'radio mark' particular molecules in their food and then see where it ends up, how it is used and manipulated. EARS can congratulate themselves on this exciting and important new research project.

Laurie Wiseman, EARS

STOP PRESS

The BBKA is launching an Adopt a Beehive scheme, in conjunction with the holidays and insurance company, Saga.

This lively idea has been developed in response to the number of people who have contacted us wanting to help the plight of the honeybee, but not take up beekeeping itself. The revenue raised will fund vital new research, and help educate the many interested members of the public who want to learn more, and make a difference.

Saga have provided a substantial financial injection, allowing us to kick-start Adopt a Beehive in mid March, at no cost to members. Further, they will provide a range of other services, including helping to publicise the scheme via Saga Magazine, and offering prizes and incentives,

A full description of what exactly will be on offer to the public and to BBKA members will be detailed in the next issue of BBKA News. You will also be able to read about the scheme in the April issue of Saga Magazine, which will come out in late March. To subscribe (you can't buy it on news-stands) ring 0800 056 1057.

Martin Smith, BBKA Chairman

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Your Letters

We Don't Know What It Was...

But it wasn't Tracheal Mite

I was taken aback by Norman Carreck's declaration in the last issue, that the connection between Isle of Wight disease and *Acarapis woodi* was mythical.

Because I have kept bees here on the Isle of Wight for over half a century I have read a great deal of what has been written on the subject. I have also tried out most of the recommended remedies including stationmaster Frow's mixture; a bottle of this still stands among my beekeeping memorabilia. Although I have not seen the darkened trachea signifying infestation for years, it was certainly present in my early days.

OK the connection is not proven but what Elsie Harvey found in the trachea and reported to her boss were not fairies. Tracheal mites do cause K wing syndrome. Hives treated with Folbex did appear to become clear of the infestation.

We may not know the whole story but I am sure that part of it at least cannot be dismissed as myth.

Rob Marshall, Isle of Wight BKA

In Response

To expand on my statement about the Isle of Wight Disease and *Acarapis woodi*. The whole story was written up by Dr Leslie Bailey of Rothamsted many years ago in a number of publications, but probably the most accessible are in the section "diseases of unknown origin" in "Honey Bee Pathology" by L. Bailey and B.V. Ball (1991), published by Academic Press, sadly currently out of print, but available in libraries, and the booklet "The Isle of Wight Disease", by L. Bailey (2002), published by the Central Association of Bee-Keepers, and available from them: <http://www.cabk.org.uk/publications.htm>

The myth arose in the original papers by Rennie and colleagues (Rennie, J., White, P.B., Harvey, E.J. (1921) Isle of Wight disease in hive bees. *Transactions of the Royal Society of Edinburgh*, 52, 737-779). These papers are well worth seeking out, if only to explore how scientists can occasionally become misled. These are the first descriptions of the newly discovered tracheal mite *A. woodi* (then called *Tarsonemus woodi*). Also

described are a series of elegant experiments, which conclusively demonstrate that *A. woodi* could not cause the symptoms of the Isle of Wight Disease. They found bees heavily infested with mites which were able to fly and behave normally, and conversely, moribund bees unable to fly, with perfectly healthy tracheae free of mites. Unfortunately, they were evidently so carried away by the discovery of an exciting new pest species (and a large and impressive one at that), that they ignored the principles laid down by Robert Koch in his "postulates", and convinced themselves that the mite that they had discovered was responsible for the disease symptoms that they observed.

Many years later, in the 1950s at Rothamsted, Bailey tried to reproduce the symptoms of "Isle of Wight Disease" in bees infested by *A. woodi*, but was unable to do so. Later, after the advent of the electron microscope, he was able to demonstrate that the symptoms were in fact those of chronic paralysis virus (CPV), entirely unknown in 1921. Experiments have clearly demonstrated that the so called "K wing" symptom is caused by CPV and not by *A. woodi*.

One reason why the myth has persisted for so long is that the conditions which favour spread of the virus also favour the spread of the mite. Bailey has convincingly argued that the Isle of Wight Disease was not caused by a new and highly infectious organism, as was believed at the time, but by an organism that was widely present, but did not normally cause a problem. He concluded that the outbreak was caused by too many colonies being kept for the amount of forage available, and a succession of poor springs causing bees to be confined in the hive, the ideal conditions for the spread of both the virus and the mite. This is crucial. Many of the diseased bees did indeed have mites, but it was the virus that they also carried which caused the disease symptoms.

As the number of colonies has fallen (from about one million colonies a century ago to perhaps 250,000 today), the incidence of both CPV and *A. woodi* has also fallen, although interestingly, samples recently submitted to the National Bee Unit have tested positive for CPV.

Norman Carreck, NDB

Welsh Beekeepers' Association Convention

9.00am Saturday 27 March 2010

Tea & coffee available from 8.30am

Royal Welsh Agricultural Show Ground
Llanelwedd, Builth Wells, Powys, LD2 3SY

Admission - £7, Juniors (under17) - free. Advance payment - £5

Guest speakers: Dr John Kefuss • Claire Waring • Richard Ball

Again in 2010 "Beekeepers Question Time"

A team of three experts welcomes questions from beginners and more experienced beekeepers. Your chance to ask that question you have always wanted to ask.

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BUCKS COUNTY BEEKEEPERS' ASSOCIATION

14th ANNUAL SEMINAR

Saturday 6 March 2010 - 10:00am to 4:00pm

Wendover Memorial Hall, Wharf Road, Wendover HP22 6HF

Speakers: Dr. Rowena Jenkins – Honey for Healing
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Andy Willis – Bees and Plants

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Your Letters

Free Range Beekeeping

I had meant to write earlier about what I consider to be a complete falsification of the facts quoted in the article Free Range Beekeeping.

In the third paragraph, I quote 'The consequences of this intensive farming has been foot and mouth disease, BSE and Avian flu to name a few'.

BSE was caused by the recycling of animal protein in ruminant feed, which had been going on for years and which many, if not most farmers were completely unaware of. Thankfully, that has been banned.

Foot and Mouth disease has been around for years and is accepted in some countries as 'one of those things'. FMD is an infectious disease affecting cloven-hoofed animals, in particular cattle, sheep, pigs, goats, camelids and deer. Indeed, the last outbreak was caused by the virus being leaked - literally - from a Government laboratory.

Avian Flu began in the Far East, where humans came into close contact with their birds, usually in poor areas where the birds share their living quarters - hardly intensive farming. At the moment, the H5N1 virus does not infect humans easily, and if a person is infected, it is very difficult for the virus to spread to another person. Although it is still present in other countries, the UK became officially free from bird flu on 20 November 2008.

David Milford, Devon BKA

In Response

I do not consider that I have made a complete falsification of facts by stating 'The consequences of this intensive farming has been foot and mouth disease, BSE and Avian flu to name a few'. I have put my interpretation on what I see happening in and around intensive farming (IF); the consequences may be direct or indirect and they may be immediate or longer term in having an effect. The breadth of one's perspective is also relevant when considering this complex arena.

IF aims to maximise the output of any commodity to meet a demand for food or just to increase profit. Often animal welfare takes second

place in the equation and can result in high animal population density, inferior living conditions and improper or unnatural nutrition. The over exploitation of animals leads to fatigue, weakness and a reduction in their ability to cope with disease and pests. As well as a deterioration in the condition of animal stocks there is often a need to spend more on inspection, medication, pesticides and hygiene to prevent the spread of any disease.

BSE was caused by the recycling of dead animal parts in a feed used in dairy cattle. Cows will do well on a natural diet of grass as well as hay and silage. These dairy cattle were fed high protein feed to achieve a significant increase in milk output. An integral part of this IF of dairy cows is the feed; this inappropriate feed caused the BSE.

Bacteria, viruses and pests are always present in nature. It is the general condition of the animals which will dictate how they cope with pestilence. Weakened, sick animals will succumb and if many do fall ill, outbreaks of the disease will be serious.

The small enterprise of a third world peasant keeping a dozen chickens might seem low intensity, but circumstances might create the conditions associated with IF. If a whole district has thousands of peasants keeping a chickens in small areas, the population density will be high; the ground will be pecked clean and birds will have inadequate nutrition, not the least because peasants may be scarcely able to feed themselves. Hungry birds suffering poor nutrition become weaker, more susceptible to disease and any outbreak will spread quickly through crowded flocks, especially if preventative medication is unavailable. If the Chinese bird flu had reached UK with any virulence, the impact on our IF poultry could have been serious. Thankfully the wildfowl population, which were thought to be potential carriers between countries, seems to be healthy enough not to succumb.

I stand by my original statement which was trying, succinctly, to get people thinking of the implications of IF and to see the parallels with beekeeping today.

John Haverson, Hampshire BKA

The Importance of Pollen

Having just read Jeremy Quinlan's very informative article on 'The Importance of Pollen to the Colony' in Decembers BBKA News, I must query one particular statement.

Jeremy stated that 'Bees are thought to have evolved from social (properly 'eusocial') Vespid Wasps'. This does not reflect current views on bee evolution. Bees did arise from wasps that switched from feeding their young on masticated (chewed-up) and regurgitated insect larvae to pollen, which both provided a rich source of protein for growth. There is strong circumstantial evidence that bees appeared during the Cretaceous period (146 – 76 million years ago) and at about the same time flowering plants also evolved. The appearance of flowers is a pre-requisite for the evolution of 'beeness'¹. Fossils of this evolutionary process are disappointing but there are Cretaceous fossils of sphecoid wasps which are thought to be ancestral to bees.

Some of the sphecoid type wasps abandoned their predatory wasp life to gather pollen and nectar. Professor S. I. Malyshev². suggests that bees evolved from wasps related to the modern sphecoid wasp of the genus *Psenulus*, which feed on the honeydew produced by aphids. However, the female wasp also kills aphids to feed its larvae by crushing them with her mandibles rather than stinging them. So the adult *Psenulus* would have tasted both the sweet animal juices while processing food for her young and the sweet honeydew which like many of today's bees and wasp was her normal food. Malyshev argues that it is a small step from collecting sweet tasting aphids to collecting a sweet mixture of pollen and nectar. In addition the female *Psenulus* lines her individual nest cells with a transparent material that is secreted by special glands - although these secretory structures are not homologous (they do not have the same origin) in embryological terms.

As flowering plants on which the aphids are found became more numerous it is possible that the female wasp supplemented their young's diet with the increasing available and probable underutilized pollen and nectar.

There is another group of wasps, the Masaridae which have independently evolved 'beeness'; these are a small family within the vespoid wasps Jeremy mentions. These small solitary wasps have developed the habit of collecting nectar and pollen rather than insect prey and have structures that parallel those seen in bees - so there are true or 'sphecoid bees' and 'vespoid bees' with all of the true modern bees having evolved from the former group. The vespoid bees never developed the complex social behaviour needed to rival true bees.

I hope that provides an insight into this complex but fascinating evolutionary discussion which by nature cannot be proven only supposed.

Bob Gilbert BSc. Master Beekeeper, Warwickshire BKA.

Reference

1. O'Toole, C. & Raw, A. (1991) Bees of the World.
2. Malyshev, S. I. (1968) Genesis of the Hymenoptera & the phases of their evolution.

Further reading

- Michener, C. D. (2000) The Bees of the World.
Grimaldi, D. & Engel, M. S. (2005) Evolution of the Insects.

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EDUCATION AND HUSBANDRY



As we are all aware, there is considerable demand for courses, especially for beginners.

E&H is anxious that the maximum opportunity is presented to potential beekeepers, but does not overload the capacity of each association. The BBKA website contains a calendar where members can advertise courses. Using this will help to spread the load and provide you with possible alternatives for students if your course is full.

The calendar can be found by following the links 'About Us'--> 'Local Courses'

Labelling

The BBKA has responded to the Food Standards Agency (FSA)'Traffic Light /Food labelling' consultation held at the end of 2009. You may remember that this process started earlier in the year and it has not gone away.

The summary of the BBKA response is:-

On the basis of 'informing the consumer', stating the sugar content of 100g of honey is not helpful. Honey should be regarded as a 'staple' and exempt from the labelling requirement - this is possible under the proposed approach.

There should be a 'spreading quantity' to help consumers manage their diet if required; such an approach is already documented for professional dieticians and other professionals.

If labelled, the label will be an 'average'. It will not be practicable for BBKA members to assay each batch of honey and print a specific label.

The full text of the response is available from the National Beekeeping Centre at Stoneleigh.

Slide and Media Library

After many years of managing and improving the BBKA Slide and Video library, Ron Hoskins has decided to retire and pass the baton to Bridget Knutson. So with effect from 1 January 2010 the BBKA Slide and Media library is now under new management. Bridget can be contacted at 6 Wideatts Road, Cheddar, Somerset, BS27 3AP. Tel: 01934 742187, Email bridget_knutson@yahoo.co.uk.

Further information will be released in the near future and the recently transferred 16mm film will be added to the library.

Chris Deaves, Chairman of Education and Husbandry Committee

VITA PHOTO GALLERY

The Vita Photo Gallery is designed as a resource for beekeepers across the globe giving public talks.

Vita is offering these photos and images which may be downloaded free of charge on condition that they are used only for educational purposes and not for commercial gain or published in any form.

The Gallery images come from several sources. Vita would particularly like to thank the Hampshire Beekeepers' Association and Mike Lambert for the use of many of their photographs; many of which come from the library of the late Frank Vernon. John Hanks also of Hampshire has supplied a series of photographs including high-magnification images of honey bee anatomy. There are more than two hundred images that can be freely downloaded from www.vita-europe.com

Photogenic Beekeepers Required

Would you like to be part of a nationwide art project, funded by Arts Council England? Artist Ed Swinden is looking for beekeepers of all shapes and sizes to sit for portraits that will form part of a snapshot of beekeeping Britain. Interested? If so, he would like to come and meet you. Email ed@edswinden.co.uk for more details.

DIGITAL TECHNOLOGY



BBKA Website Update www.britishbee.org.uk

BBKA News Archive – Members Area*

The BBKA News magazine archive now covers all issues from 2001-2009. Each issue is published in electronic format (PDF) that has all the advantages of the Adobe Reader, allowing members to download and magnify the pages on screen for comfortable reading or reprinting.

Public & Products Liability Insurance – Members Area*

BBKA members can download a copy of the insurance cover note and the full insurance Schedule which covers the period 28 October 2009 – 28 October 2010.

Future Website Developments 2010

- Online beekeeping courses within a virtual learning environment (VLE)
- Secure online forms to replace manual forms used by BBKA Secretaries.

The Avon Beekeepers' Association proposition (January 2010 ADM) stated that it is difficult to find key information; do you agree? I have started a thread on the BBKA Discussion Forum** entitled "BBKA Website Consultation 2010" in the 'General Natter Forum'. I would be interested in your views and suggestions on ways of improving the BBKA website.

*For the Members Area click on the **Members** tab and select Password Protected Area (login details are on the back of your current BBKA membership card).

For the Discussion Forum click on the **Help! tab and select Discussion Forum.

Steven Turner, Website Administrator

www.honeyrecipes.org.uk

Roger Patterson, the 'editor' of the site, is a beekeeper and not a cook but it has been designed to appeal to beekeepers and non-beekeepers alike. His aim is simplicity and continuous improvement. The recipes have been sourced from around the world and have not been tested; something that is planned for the future.

The 'Home Page' has a list of subjects such as cakes, desserts, bread and pickles. When these are accessed the recipes on the chosen topic appear on the screen. It would be nice to have an index as it works when only four recipes are displayed, it then easy to see what is available but not if there are seventeen as in 'cakes'.

Each page has a search facility so if you have a glut of apples or need a recipe using pineapple you can put in that word and all the recipes containing that word will be listed with their number. Beware if you put in 'potato' you get one recipe and that uses a potato masher. Alternatively if you have the recipe number you can easily find it again by using the search facility.

The recipes are clearly written but there is no consistency in the units used, presumably because they have been collected from around the world and added to the site as given. There are metric, imperial, cups and spoons often more than one unit in the same recipe but I assume this is correct for the country of origin which is not given. No credits are given as Roger often receives the same recipe from different people.

All recipes have a 'printer friendly' version.

I use the computer a lot but am not a 'silver-surfer' because I usually end up shouting 'give me a book!' I did not do this with this site I found it easy to use and the recipes were very varied. I would have liked an index but this is a small quibble from someone who does not like websites. I shall definitely use it and am already about to try the stuffed peaches.

Mary Hill, Kent BKA

From the Desk of the General Secretary

As I approach the start of my third year as BBKA General Secretary, 2010 promises to be yet another challenging year for all of the staff at the National Beekeeping Centre (NBC).

This time last year we were experiencing what we thought was a blip in new members that we all now know was the start of a phenomenal growth curve that still shows no signs of slowing. We now have over 16,000 beekeepers on the register, by far the largest organisation in its field. Beekeeping is going through a very exciting, albeit occasionally traumatic, time and we all have to learn to deal with this new found popularity and status.

For NBC this translates into more telephone calls, e-mails and letters, more meetings to organise or attend, more Welcome Packs to distribute and just about more of everything. We are having to re-examine many of our existing office procedures as they cannot cope with the increasing volumes or are no longer appropriate. Last year saw us absorb the financial responsibilities of the organisation into the office and this will continue to require development and refinement.

After many years of being boxed and sealed a superb collection of books is now available in our new Reference Library with the many duplicates being sold to the membership. This service will also need developing, managing and resourcing if it is to deliver what the membership is demanding.

This year's education focus is generating many new initiatives and leading to increased usage of all of our super facilities at the NBC, particularly the auditorium. In addition to the many internal events that are scheduled we have agreed to host a spring regional conference for the National Association of Pest Control Technician (NAPT) which will give us an opportunity to build relationships and influence the way they handle honey bee situations in future.

On the show front, we may have lost the Royal but we have accepted an offer to attend Gardeners' World Live exhibition at the NEC which promises to be an excellent replacement.

All in all a very busy year ahead and one I hope is as successful as 2009.

Mike Harris, BBKA General Secretary

ADM Report January 2010

I have reported on some of the issues at the ADM in my chairman's column on page 2 of this edition, but I would like to confirm the results of some of other debates and elections that took place.

The trustees were pleased to announce two new corporate members, New Holland, manufacturers of tractors and agricultural equipment, and B & Q Plc. The funds that these corporate subscriptions bring to the organisation will help with research funding and general funding for education. In addition a preliminary announcement was made about an association with Saga. You will see a small 'Stop Press' about this on page 23.

During his report on the activities of the Technical Committee, Dr David Aston was able to report on the financial support that the BBKA had agreed to make to a PhD student working at Sussex University. The total sponsorship over three years represents just over 50% of the current research fund of the BBKA.

A comprehensive report on the finances of the charity was presented by the Vice Chairman / Chair of Finance Michael Sheasby, with particular emphasis on working towards an established policy for the various reserve funds that the charity has. He also drew members attention to the large increase in the budget for educational and training initiatives.

In a new departure, candidates for election as Trustees and for the examinations board were asked to give a one minute presentation. This was generally welcomed and assisted delegates in their difficult choices. Both sets of candidates were of exceptional quality this year and with contested elections, this gave delegates a chance to make real choices about the compositions of the Executive and Examinations board.

Applications for membership of the BBKA were received from Rutland BKA, Lancaster BKA and Bees for development. All three organisations were admitted. It is encouraging to see that the BBKA continues to grow both in terms of membership and by attracting new groups to affiliate. A debate took place on the whether the BBKA Executive should be instructed to rejoin the Fera's Healthy Bees Plan Project board. Arguments were put on both sides but in the end the vote was heavily in favour (75%) of the BBKA executive's position. The Trustees continued to commit to engaging with both FERA and DEFRA to ensure the best possible outcome for our bees – whether that be by rejoining the project board or remaining outside of it. I am pleased that the membership as a whole have been able to back the Executive over this proposition – it shows to me the trust you have in our ability to act on your behalf and can only strengthen our resolve to work for the best outcome in our relations with government.

A brief debate took place about the upgrading of the BBKA website towards the end of the proceedings. I personally would have liked more time on this proposition to outline to the meeting some of the things we have in mind, but time had got the better of us by then! I can confirm however that the Executive will be setting up a small project group including the current webmaster Steve Turner to substantially upgrade the BBKA website. It has grown over the years and we now need it to be a world class site, to reflect the activities that the charity is now undertaking.

Finally, it was interesting to note that one delegate apologised for the way they were voting. They had been strictly mandated on every issue and were not able to take account of the debate. Associations might give thought in future to giving delegates strong guidance on which way to vote but ultimately allowing them the final say so that they can take account of information they glean at the meeting.

Overall a long and tiring day, but one that succeeded in setting the policy direction for the BBKA for the next 12 months.

Martin Smith, BBKA Chairman



WANTED

Stewards for Stoneleigh
Saturday 17 April 2010

To ensure the continued success of our Spring Convention, a number of additional stewards are required to compliment our winning team.

Free entry to the Convention, together with a duty rota that will ensure more than sufficient free time to enjoy the event, a free lunch and a small emolument towards your expenses will, I am sure, complete an enjoyable day.

So, why not join us and contact me by 1 March 2010.

Chief Steward **Norman Hughes**

103 Coniston Road, Basingstoke, Hampshire RG22 5HU

01256 464280 e-mail: norman.hughesbees@btinternet.com

Missing

Volume II of Bee-Keeping New and Old Described with Pen and Camera by William Herrod-Hempsall the property of

The Ipswich & East Suffolk BKA whose name appears on the flyleaf.

Reward offered - apply to Jeremy Quinlan 01473 737700.

THE BBKA ON SHOW IN 2010

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or at

BBC GARDENERS' WORLD LIVE

16 – 20 June

at NEC Birmingham

or at

HAMPTON COURT PALACE FLOWER SHOW

6 – 11 July

or at

Scotgrass: 11 May, Crichton, Dumfries

Cereals: 9 – 10 June, Royston, Hertfordshire

Royal Highland Show: 24 - 27 June, Edinburgh

Royal Welsh Show: 19 - 22 July, Builth Wells, Powys

CLA Game Fair: 23 - 25 July, Ragley Hall, Alcester

where BBKA will join its new corporate member
New Holland Agriculture to meet the farming community,
landowners and fruit growers

Please contact

christine.m.gray@btinternet.com or ring 07891 000207/ 01462 450707

to let us know when you can help

NATIONAL INSECT WEEK 2010

"Discover Diversity in the World of Insects" is the theme of
National Insect Week which will be held from 21- 27 June
during the year which the UN has declared the
International Year of Biodiversity.

For more information on forthcoming plans, and how to promote
any events and talks your association would like to hold during
the week log onto on www.nationalinsectweek.co.uk

Diary of Events

2010

20 February – Somerset BKA Lecture Day, at Cheddar. Speakers
include Dr Ivor Davis, Prof Robert Pickard, Jürgen Tautz, Mathilde
Briens. Tickets Caroline Butter, The Old Manse, Draycott, Cheddar
BS27 3SF. Tel: 01934 742075

20 February – Wisborough Green Division, West Sussex BKA,
Beginners' Day at Pulborough Village Hall. Enquiries: Roger Patterson
roger-patterson@btconnect.com 01403 790 637 or 07976 306 492

27 February – Middlesex Federation Day at Broomfield School,
Wilmer Way, Enfield N14 7HY Speakers: Dr Beulah Cullen NDB, Terry
Clare and Clive Cohen. Details from Jo Telfer 020 8868 3494

27 February – West Sussex BKA Convention, Lodge Hill Centre,
Pulborough. Speakers: Dr Max Watkins, Ian Homer, Dr Michael
Keith-Lucas. Workshops with Liz Duffin, Mike Duffin, Oliver Field, Ian
Homer, John Williams. See www.wsbka.org.uk or Christine Stevens:
01243 533559, e-mail: wsbkaconvention@googlegmail.com

27 March – Welsh BKA, Builth Wells, Speakers: Richard Ball,
Dr John Kefuss and Claire Waring

16-18 April – BBKA Spring Convention at Stoneleigh, page 3

15 May – Sussex Bee Market - Heathfield Community College

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via your Association secretary, to the BBKA Members' Register.

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