

BBKA News

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



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Ensuring Honey Bee Health is Crucial



With the unusually variable weather pattern across the UK this year we have seen de-synchronisation in the blossoming of many plants and their pollinator availability, with reduced pollination of some economically valuable plants and reduced bee forage. Honey bee health is therefore high on the agenda for all of us and this is highlighted in two articles in this issue of BBKA News. The European Commission has shown its commitment to our pollinators' wellbeing by appointing the first EU reference laboratory for honey bee health. This laboratory, appointed in 2011 and based in France, is gearing up to implement a pilot surveillance programme (PSP) that will collect data about colony losses, pests and diseases status. The PSP is open to participation from Member States and the National Bee Unit (NBU) submitted a proposal to contribute on behalf of England and Wales, which has met all the EC's requirements. Gay Marris and Mike Brown explain how the NBU is implementing its PSP across England and Wales on page 21. Data generated from

this pan-European assessment will, for the first time, enable comparisons of honey bee health to be made across Europe which will influence EU policy decision-making, and ultimately, help promote honey bee health.

In addition to ensuring our bees are free from pests and disease, one way to maximise colony health is to provide optimal nutrition. In her article On The Topic of Honey Bee Nutrition, page 5, Deborah Delaney explains what nutrients bees need to live long and healthy lives. She describes research findings that identify foragers' nectar preferences and classify plant pollens for their nutritive value to bee development. So, if you are considering what to plant in the garden this autumn or are intending to provide sugar and pollen supplements to your colony, this article will help you understand what can best support colony health.

Read more about these articles on pages 5 and 21.



In the Apiary
Why do summer bees live for six weeks and winter bees for six months? Turn to page 4 and all will be revealed.



Bee Diagnostics
Ever wanted to look inside a hive without opening it up? These scientists can. Find out how on page 18.



Selling Bee Cosmetics?
If you are creating cosmetics made with bee products then head for page 27 for an up-to-date guide to EU legislation.





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Chairman's Letter



The British are said to be obsessed with the weather and as beekeepers we are particularly aware of the effects of poor weather on our bees. It has certainly been a recurrent theme in my *Chairman's Letters*. By the time you read this one hopefully we will have had some fine autumn weather to enable our bees to benefit from late forage to help provide them with stores for the winter and early spring.

We plan to carry out our sixth BBKA member's Winter Survival Survey this year. The start date for the survey is 1st October so please make a note of the number of colonies you have on that date in case you receive a request to complete a survey form in early spring next year.

Many members are involved in setting up and manning show stands that are shop windows for our craft and provide beekeepers with opportunities to talk informally to the public. I would like to thank all of you who have represented beekeeping and talked to the interested public and made them more aware of what we do.

The media has drawn attention to the problems caused by bad weather for butterflies, moths, hoverflies, bumble and solitary bees. The full picture is that the effects of weather coupled with poor forage availability through loss of food plants and habitat degradation is having significant effects on the numbers of our insect populations and thus their role in pollination, and many people have noticed this in 2012. Land stewardship, which mainly rests in the control of humans, is vital to animals and insects so all who have responsibilities for land should think about the needs of wild species and the food webs they create, and not only about the justification of habitat destruction as a part of economic development. As beekeepers we can support honey bees by providing food and good shelter and responding to a colony's needs. We must also continue to press our message about the importance of the honey bee and at the same time acknowledge the plight of many insects. Our policy-makers and politicians should be raising the level of their efforts to promote and encourage the creation of more diverse habitats to encourage an increase in the range and quantity of insects they can support, as this will have a beneficial effect on all wildlife.

All beekeepers should be aware that their beekeeping activities may affect other beekeepers and their bees. If there are too many colonies for the available forage bees will suffer and become more vulnerable to disease and starvation, so when considering new apiary sites please take extra care to ensure that you are not affecting another beekeeper's colonies. Good neighbourliness is good practice in beekeeping and as there is a strong demand for UK honey let us work to grow the market and encourage more of the public to eat delicious and well presented honey.

David Aston, BBKA Chairman

Cover photos: Main image: Don Coats; Top right: Dr Bee; Middle: Mark Greco; Bottom: Dr Sara Robb.

Disclaimer: Opinions expressed in articles in *BBKA News* are those of the authors and do not necessarily reflect those of the BBKA.

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In the Apiary

Have you ever wondered why bees die? From recent evidence it seems that we humans have a better chance of living longer if we are able to take exercise and eat a wide variety of fresh food. Of course humans can die earlier because of disease and accidents and it is the same with bees. With all animals there seems to be a natural limit to our lifespan if we are fortunate and do not suffer an accident or disease.

We all learn early in our beekeeping life that there are two sorts of bees. Summer bees live for six weeks having taken about three weeks to develop from an egg whereas winter bees live for six months once they have developed from an egg. This in human terms is a phenomenal extension of the natural lifespan and it raises the question of how do bees do it?

Research has shown that very few bees die of old age. In fact most bees and probably all the so called 'summer' bees die because of hard work. They are exhausted by their duties and usually die on their last foraging flight away from the nest. There appears to be two duties in particular that age bees and shorten their lives. Firstly, young bees in the nest need to produce brood food to feed larvae and they also feed the queen with a very high protein 'soup'. This food is made in the hypopharyngeal and mandibular glands and draws heavily on the energy reserves of the bees.

Once the bee becomes a forager it will be flying from the nest whenever possible to gather resources for the colony. Flying is achieved by flexing the thorax using large indirect muscles and adjusting the shapes of the wings using small direct muscles. Flying is also very energy consuming and has the effect of wearing out the bee. If a bee wants to live for a long time it should only feed a few larvae and avoid flying as much as possible!

During the spring and summer the number of bees in the colony is building up rapidly (we hope!) and there are also many flowers offering pollen and nectar (in normal years!). This means that there is a need for the workers to feed large numbers of larvae and fly as much as possible to gather the available resources. At these times the workers will work hard and die young. Usually within six weeks.

Contrast this with the condition in late summer and autumn. Now the queen has reduced her laying rate considerably so there are fewer larvae to feed, in addition there is less forage about so the bees are not flying as much, especially if it has been a good summer and the bees have collected plenty of surplus honey and pollen. In addition the colony is large, almost as large as it has ever been during the season. We now have a situation where the amount of feeding has reduced, the need for foraging flights has

lessened and there are far more bees to do the work. Each individual bee has much less to do and is able to live longer. There are also physiological changes occurring. The house bees will still consume large quantities of pollen and, instead of metabolising this to brood food, will store it in their fat bodies as a food reserve; a bit like polar bears do before hibernation. In this condition the colony prepares for winter in the knowledge that these bees will survive a long time (they stay 'young') inside the hive and once conditions improve in the following spring they will be ready to feed the new larvae and forage for fresh pollen and nectar.

Under normal 'working' conditions adult bees live over a period of two brood cycles before they die of hard work. This will be approximately true for the winter bees that need to raise the next generation of workers.

You may wonder why this is important to beekeepers. The lesson to be learnt is that if our winter bees are not in top health they could well die during the winter months or during the critical time when the new cycle is commencing

and new brood needs feeding. It is probably reasonable to say that if your winter bees are not in top health it will be difficult for the colony to survive the winter and build up in the following spring. We need to ensure we control varroa numbers because they can invade the cells of the new larvae and kill them or at least weaken them. In addition varroa is an effective vector for many viruses; viruses

will debilitate or even kill the winter bees and will be passed onto the new brood, which will be killed before being able to take over from the winter bees. Other diseases such as nosema and chalk brood will also weaken a colony and make it harder to build up in the following spring.

So we must all remember that we need lots of healthy bees going into winter; the colony needs protection from predators and disease, and it requires plenty of food stores to see it through the inclement months. If you do not look after your winter bees then next year will be a struggle for the colony or you might just find that your lovely colony of bees cannot survive.

So what is the potential lifespan of a worker honey bee? We do not really know but it is probably longer than the six months expected from a winter bee. Life for worker bees is hard; they work hard and die young!



Top: Worker collecting food. Bottom: House bees attending queen.
Photos by Dr Bee.

Dr Bee

On the Topic of Honey

Bee Nutrition: Part I

Honey bees are the most economically valuable pollinators of agricultural crops worldwide.¹ One third of the total human diet is dependent on plants pollinated by insects, predominately honey bees.² Yet, honey bee populations are in jeopardy as evidenced by the dramatic loss of approximately 33% of over-wintered colonies each year since 2007.³ Since 1987 with the introduction of *Varroa destructor*, problems related to pathogens and pests of honey bees have risen dramatically.⁴ Additionally, residues of miticides and fungicides are the most frequently detected compounds in foundation and comb beeswax, pollen and honey.⁵ With the detection of various chemicals associated with honey bee forage, i.e. nectar and pollen, what is the effect of these on the health of honey bees? To help answer this we first need to understand the nutritional requirements of honey bees and which plants produce the optimal supply of the essential nutrients. So the first question should be, what do bees eat? Just like humans, bees require carbohydrates, proteins, fats, sterols, minerals, vitamins and water in order to live a long and healthy life. I will now briefly describe each of these groups and consider where bees may obtain the nutrients from.

Carbohydrates

Carbohydrates encompass a large group of compounds (sugars, starches, celluloses etc.) that can easily be broken down to provide energy at the cellular level. Carbohydrates are required by both the adult and larval stage for normal growth and development. They generate energy for muscle activity and are absolutely essential for fueling flight muscles. They are also the primary energy source for maintaining the required body and nest temperature. An elevated intake of carbohydrates in the form of honey is correlated with proper wax gland function and secretion. A classic



Figure 1. Honey bees robbing sugar syrup from a Petri dish. Photos 1–3 and 5 by Deborah Delaney.

study estimated that close to nine pounds of honey was needed to make one pound of wax.⁶ Both nectar and pollen are the primary sources of carbohydrates.

Nectar

Nectar is a plant-made liquid primarily produced in flowers, but other sources include extrafloral nectaries. Also, plant-feeding insects produce honeydew as an excretory product, which is also collected by foragers and has a similar chemical composition to flower-produced nectar. Nectar is the main source of carbohydrates for a colony; the primary sugars identified in nectar are sucrose, glucose and fructose. Not all nectars are identical and the sugar content can vary greatly with reports of 4% to 60 % and higher. Nectars with higher sugar contents are preferred by foragers and studies by Waller⁷ found sugar solutions of 30–50% elicited a maximum collection response.

Honey

Honey is nectar that has been enzymatically converted via the addition of enzymes from the hypopharyngeal gland, mainly diastase, invertase and glucose oxidase. During this process most of the sucrose is changed to fructose and glucose. The nectar then goes through a ripening and evaporation stage that protects it from fermentation by yeasts and bacteria. Once fully ripened and capped under beeswax 99.9% of the solids in honey are sugars.

Nectar and honey requirements

The amount of nectar and honey that is needed for optimal colony health and longevity depends on many variables. The size and strength of a colony determines the amount of nectar and honey the developing brood and adults will need to sustain themselves. The weather directly affects the timing of flower bloom and the availability and amount of different types of plants and nectars. Other environmental variables also affect nectar production including soil, temperature, humidity and sunlight. On average a colony will require around 150–180 pounds of honey annually; a colony requires anywhere from 50 to 80 pounds of honey from the time brood-rearing ends in the autumn until the first flowers open in the spring. Summer requirements range from 90 to 100 pounds depending on the length and severity of the season.

As we can see from observing bees foraging on different plants not all nectar is equally enticing and sugar concentration is one of the main factors that influences foraging decisions. Early studies by Von Frisch⁸ showed that bees prefer certain sugars over others. In fact honey bees recognise only a few sugars as being sweet: glucose, fructose, sucrose, melizitose and maltose. Early studies also show that bees actually show a preference, when given a choice, to sucrose followed by glucose, maltose and fructose.⁷ This preference, not surprisingly, translates to a higher nutritive value as well. Studies by Barker and Lehner^{9,10} revealed that bees fed sucrose lived longer and developed better than bees fed diets composed of other sugar sources.

Just as there are sugars that increase the quality and longevity of the honey bee there are others that are toxic to bees. These toxic sugars are mannose, lactose, galactose and raffinose. Generally these sugars are from non-floral sources and not secreted in nectar. However, bees fed these sugars have reduced longevity and sub-optimal development.

Protein

The second major nutritional requirement for honey bees is protein. Protein is essential for the development of body tissue, muscles and glands. Proteins are the building blocks of cells and, therefore, of life. All organisms require adequate protein levels in order to ensure proper development.

Pollen

One of the main sources of protein in a honey bee diet comes from pollen. Just as nectar is converted to a storable energy source in the form of honey, pollen is

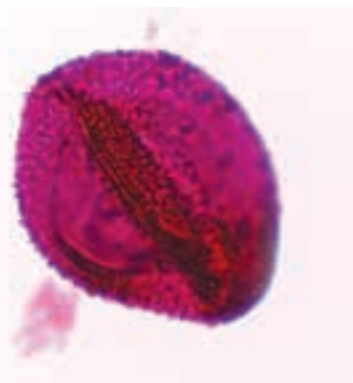


Figure 2. Pollen grain from watermelon.

processed via fermentation to a storable protein source called bee bread. Pollen is the male gamete or sex cell that is produced by the male sex organ of a flower also known as the basal stamen and anther. During pollen collection bees inadvertently transfer these male gametes to the receptive female organ of a flower, which generally results in pollination. Early binges on bee bread during larval development aids in the formation of fat bodies, internal organs and glands. A high consumption of bee bread also promotes egg-laying in queens. Factors that affect the nutritive value of pollen are largely environmental such as temperature, soil moisture and soil pH, but protein levels also vary widely depending on the plant type. Protein levels from pollen of different plants range from 8 to 40%.

Four groups of pollen

A study in 1953 by Maurizio¹¹ looked at the difference in honey bee development, primarily fat bodies and the hypopharyngeal gland, when fed different pollen sources. From this work pollen was classified into



Figure 4. Honey bee foraging for pollen from a corn tassel. Photo by Don Coats.

four groups based on its nutritive value: highly nutritious, nutritious, fair and poor. The first group, considered to be highly nutritious, contains pollen from plants such as willow, clover, maize and fruit trees. The second group consists of pollens from plants like dandelion, elm and cottonwood. The third group, considered to be fairly nutritious, contains alder and hazelnut. The final group of pollen had very little to no nutritional value. These plants are generally wind-pollinated and pine trees fit into this group. Later, follow-up studies focused more on protein content and amino acid composition,¹² and how pollen converts to brood.¹³ These studies found that pollen not only varies from species to species but from season to season, and that bees seem to prefer mixed pollen sources.



Figure 3. Honey bee foraging for pollen (note purple pollen) from *Lacy phacelia* (*Phacelia tanacetifolia*).

Pollen requirements

Various studies have looked at the amount of pollen that a colony would need to reach healthy, productive population numbers. Most of the research estimates that a honey bee colony requires an average 40–140 pounds of pollen annually. This is a large range but it is dependent on the length of the season, the protein value of the local pollen sources and the genetics of the bees themselves. A study by Haydak¹⁴ found that each larva needed 100 mg of pollen to complete development from the larval stage to the pupal stage and on through to adult emergence.

Protein building blocks: amino acids

Different pollens can have different mixtures and quantities of amino acids. A study by de Groot¹⁵ showed that most pollen contains all the essential amino acids: arginine, histidine, lysine, tryptophan, phenylalanine, methionine, threonine, leucine, isoleucine and valine. Amino acid composition is a major factor in the nutritive value of different pollens. However, the predominant amino acid in mature fermented pollen is proline. Proline is found in high levels in all insects and is an essential substrate for the citric acid cycle. Proline is extremely important as a substrate for flight metabolism. One

question that many beekeepers are asking now is whether stored pollen or bee bread loses its nutritive value. Haydak and Dietz fed honey bees old bee bread and found that the bees could not develop properly.¹⁶ However, when lysine and arginine were added to the pollen its biological value was restored. With the fairly new and pricy practice of comb irradiation it would be useful to know if bee bread or stored pollen loses its biological and nutritive value over time.¹⁷

Lipids, fats and sterols

Lipids and fatty acids are the building blocks of phospholipids, which are a major component of cell membranes. These complex lipids are the precursors to important hormones involved in the molting process during the insect's life cycle and serve as a primary energy store for insects in their fat bodies. Fatty acids also are used for the derivation of different defensive secretions in some insects. The loss and depletion of fatty acids is linked to the desiccation of many insects and they also aid in the lubrication of food.

Pollen contains a fair amount of lipids and sterols. The lipid content, just like the carbohydrate and protein content, varies depending on the pollen.^{18,19} Studies have shown that lipid content can range from 13% in mustard pollen to 20% in stored pollen mixtures.

Unlike humans and many plants, insects (honey bees included) cannot synthesize sterols and therefore require a dietary source. Sterols are also components of cell membranes and many exterior surface waxes on the bee's exoskeleton contain sterols. Honey bees use sterols acquired from plant sources as precursor molecules for the production ecdysteroids, which are



Figure 5. Worker bee constructing queen cup.

essential in the molting process from instar to instar, from larva to pupa and from pupa to adult. There are two types of sterols that are predominantly detected in pollen: 24-methylene cholesterol and B-sitosterol and both of these are the precursor molecules used to make the molting hormone in honey bees.

Honey bees require cholesterol or 24-methylene cholesterol for normal growth and development. It is a precursor for the production of hormones that initiate molting and it is found in many plants. Diets supplemented with cholesterol or 24-methylene cholesterol supported large amounts of sealed brood.²⁰

Vitamins and minerals

Nectar and pollen both contain many vitamins and minerals. The variation in these nutrients is as varied as the plant species themselves, but there are certain consistencies that can be described from previous research. Pollen contains the B-complex vitamins (thiamine, riboflavin, pyridoxin, pantothenic acid, niacin, folic acid and biotin). These vitamins are crucial for hypopharyngeal gland development.²¹ Pantothenic acid is now known to play a critical role in queen/worker differentiation. Riboflavin, nicotinic acid and pyridoxine levels have also been correlated with brood rearing; Anderson and Dietz found that 5.4µg of pyridoxine was needed to rear one larva to the capped stage.²²

Like the other essential nutrients pollen contains all of the essential minerals: sodium, potassium, calcium, magnesium, chlorine, phosphorus, iron, copper, iodine, manganese, cobalt, zinc, and nickel. Many of these minerals are important components in enzymatic metabolism and in nervous system activity. To emphasize this point, the minerals identified in the three main body regions of the honey bee and in royal jelly are potassium, sodium, magnesium and phosphorus. These minerals are crucial in honey bee metabolism and also in proper nervous system functioning. Just as found with other organisms, minerals in honey bees have been shown to decline with bee age and so it has been a practice to supplement diet with a sprinkling of pollen ash or burned pollen.

Water

Without water bees will die within a few days, if not sooner. Water loss and desiccation is the biggest obstacle most insects must overcome due to their large surface to volume ratio. Water carries dissolved nutrients to all parts of the body and aids in the removal of waste from the

body. Water also aids in ingestion and digestion as a lubricant and carrier. Water is used to dilute thick honey and nectar and larval food may contain up to 66% water. As important as all these dietary functions of water are to honey bee survival at the individual level, at the colony level water is also crucial. Hive bees must maintain a temperature between 31°C and 33°C (89°F and 92°F) and a relative humidity of 40–60% depending on the ambient conditions.²³ Water collection is essential to thermoregulating the colony during the dry and warm seasons.

Although there is much research to date on the nutritional requirements of bees much of this work is dated and does not represent the modern foraging environment honey bees are subject to. The landscape is becoming more and more fragmented with limited monocultures of forage. With the detection of various chemicals in hive matrices and the constantly changing landscape new studies are focusing on understanding the roles microflora play in nutrient assimilation and food processing in the conversion of pollen to bee bread. Part II of *On the topic of honey bee nutrition* will focus on these themes.

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Spring 2013 Convention

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Friday 12 – Sunday 14 April 2013

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Friday 12 April
Members Day

Saturday 13 April
Public Day and Trade Show

Sunday 14 April
Education Day

Further information will appear in the beekeeping press and on the BBKA web-site in due course.

Tickets on sale – January 2013
On site accommodation bookings open – January 2013

Make a note in your diary!

General enquiries: Tim Lovett
tjl@dermapharm.co.uk

Trade Show enquiries: John Hayward
jvhayward@suffolkonline.net

Musings

I have heard it said that some beekeepers feel *BBKA News* should only contain technical matter and should not contain what may be considered more light-hearted aspects of beekeeping or beekeeping-related matters. For these people, who obviously have a poor grasp on reality, can I say that not all beekeepers are technical experts; indeed some of them have quite a sense of humour and enjoy a lighter touch from time to time. If you are in the former category, look away now for the next six or seven hundred words will appear to you as total drivel, otherwise sit back and enjoy.

I had the pleasure to go to a musical soiree just recently. It was performed by some celebrated musicians who were very popular some forty plus years ago; indeed they mentioned that as an ensemble, they had been around for fifty years this year — uh huh, it was The Manfreds! It was an excellent concert that brought back many memories to the attendees and they performed a number of songs which were not their own originals including a number called 'My Girl' (originally performed by The Temptations). Now it has taken me a long time to get there but one of the lines is 'I've got so much honey the bees envy me' and that started me thinking.

How much honey have I got this year? Well it is very little compared to normal — probably about 10% of a normal year's average and just about 6 or 7% of last year's crop. We all know many of the reasons for this and indeed I understand that many (although I realise not the technical experts) are in the same boat. Could I have done anything to have increased it and have helped the bees along? Well, I know of at least one beekeeper that has been heavily feeding his bees in order to keep them going throughout the difficult parts of the season and has still been extracting a 'honey' crop from those colonies! That seems to me that he is helping himself but doing little to help the bees.

Some beekeepers apparently found that, although they were feeding them, their colonies were still not prospering and that queens had gone off lay. This is a salutary reminder that colonies need not just carbohydrate to survive but also protein; with the protracted periods of rain which many parts of the country experienced, it is highly probable that pollen shortages were to blame here. I hope that we will all learn from this experience should those weather conditions occur again as we can make a difference by keeping a proper food balance available.

Where we may have less impact, however, is in matters of swarming, queen raising and matings. Many beekeepers (including some of those who will not be reading this) suffered from extensive swarming even from colonies that had been subject to swarm control. This activity seemed to defy all that has been written about swarming and swarm control by technical experts over the years and suggests that, when conditions are seriously adverse, bees become opportunistic in their quest for survival. However, opportunism alone is not sufficient as some reasonable opportunities for matings are also necessary. Since these were in short supply, were there any other approaches we could have employed? The only one which appears to be a realistic option is instrumental insemination (I know instruments are used but is there any real reason why our technical specialists insist on calling it instrumental rather than artificial insemination; with the other creatures where we practice it, we call it AI?)

But is this a realistic option? The equipment necessary to carry it out is likely to run into several thousand pounds which, to me, seems a relatively small capital outlay if several hundred, or several thousand satisfactorily mated queens can be produced each year. Just how many beekeepers in the UK practice instrumental insemination is unclear; it is probably a very limited number. But, maybe it is a reflection of our rather amateur approach to beekeeping that so few seem to practice it.

Another approach I have heard about is to sell queen cells. The beekeeper in question is taking money from beekeepers for these cells but leaving them with the problem of getting any queen which emerges mated. It seems to me that this is as unethical as selling honey extracted from colonies which have been subject to feeding!

Back to the concert, as a footnote. I did ask several members of the band just how they managed to have so much energy at their ages (though a little more diplomatically than that). The answer came back, 'it's all down to the drink and the drugs ... we always finish the evening with a cup of cocoa and a Nurofen!' I could have suggested honey but I didn't feel I could top that answer!

A warm welcome back to our technical colleagues.

The Forager



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if you are a slow-worm, hedgehog, dormouse or solitary bee. Honey bee hotels ('hives' to you and me) have been around for years, and without the pastoral care this offers, bees would be in even more trouble than they already are. Wildlife benefits from 'hotels' not only because it can be monitored, fed and helped from time to time, but to escape the ravages of human activity, as there is little wilderness left that escapes this. Wildlife can find itself in danger anywhere; in the countryside from machinery, from chemicals or monoculture; in towns, from people, traffic or predators.

During the start of late summer grass cutting I had a full week of mourning. I hung up my garden fork and strimmer and did not even want to look at them. It was one of those unforgettable accidents. Strimmers are dicey at best, but in a split second they can literally obliterate. I was manoeuvring the head at an angle to cut a neat path edge (the grass was long) in the herb garden. As soon as I saw it, it was too late. There before me, lay a stricken slow-worm, with a gash down one side. I could not believe my eyes. As I knelt I could see several baby slow-worms wriggling out of this gash; it is a little known fact that they give birth to live young in August, lying in the sun beforehand to raise their body temperature. She was about to give birth, and like one I rescued only last spring when the adjacent field was cultivated for sowing wildflowers. She was alive, but badly wounded and all I could do was gently cover her and her babies with grass. I cried. That evening I returned, to find at least a couple of babies very much alive. I rushed off to find them some tiny snails, compost and a sheltering piece of wood. In the morning, I lifted the wood; there lay an empty snail shell, and one alert baby shot its head up for a moment (the mother who had died was removed and buried elsewhere so as not to attract predators).

That is when I decided to build these baby slow-worms a hotel, right there, in the herb garden. It feels as if all wildlife is teetering on the brink of survival; surviving only when we stop our constant cutting, rotovating, strimming, spraying, obsessively cutting back the natural world.

How to build a wildlife hotel

The hotel consists of a stack of pallets, five is an ideal number. The lower pallets can be loosely edged with some old bricks (the sort with holes), filled with friable garden compost, dead leaves a few stones and the lower sides planted with herbs like wild thyme and oregano. The top pallets (at least one metre above ground) should hold drain pipes or open ended plastic bottles, stuffed with hollow sticks or bamboo 5–9mm in diameter; this will suit red mason bees (who are more efficient pollinators than bumblebees), some larger diameter hollow sticks will suit ladybirds and lacewings. Holes drilled in solid blocks of wood also serve well. For protection, a slightly slanted and secured roof (perhaps covered with sedums) will top the hotel.

Earlier this year there was yet another accident with said strimmer: a young wild cherry tree, planted three years ago and growing beautifully. In clearing the sea of nettles around it (a job best done by hand), one gentle thrust a little too near the trunk and the delicate young bark was stripped off two-thirds the way round. If left, this could have meant death to the tree.

However, some nifty first aid was the rescue.

First aid for a wounded tree

We hunted in the shady hedgerow and found a handful of fresh, moist spagnum moss and in the kitchen found one black, plastic rubbish bag and a pair of scissors. A long strip about two inches wide was cut down the length of the bag and unfolded. The torn bark was put back in place and the moss held over it while the plastic was bandaged around the trunk (some excess at the start was used to tie a knot at the end). This stayed in place for five or six months, and when I took off the bandage last week it was almost impossible to tell the tree had ever been wounded. If kept moist, bark can regenerate and heal itself like skin.

Jobs for October

- ❑ Build a leaf mould cage. This can simply be four posts creating corners of a square, and chicken wire wrapped all the way round. It is good practice to gather up dead leaves, which otherwise harbour slugs, snails and mildew. Leaves rot down in a year or two and the resulting leaf mould is lovely organic matter, good as a soil conditioner, for seed-raising or potting compost.
- ❑ Prepare ground for bare-rooted tree planting in winter or vegetable beds by turning over the top few inches and leaving clods for the frost to break down.



Strimmer operators please observe the following rules:

- Always keep the strimmer head parallel with the ground.
- Never cut lower than three inches (10cm) which is also important for wildflower meadow plants.



Honey bee on *Nepeta cataria*. Photo by Sarah Holdsworth.

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(All October 2011)

Neonicotinoid Insecticides:

The case for farmers to report the sowing of treated seed

Introduction

Readers of BBKA News will have seen recent articles discussing the effects of neonicotinoid insecticides on honey bees. My contribution about the SETAC 'Pesticide Risk Assessment for Pollinators' Workshop, appeared in the May issue. This was followed by an article by Dr Louise Westwood in June. In July, the front cover was given over to a report from the European Food Safety Authority (EFSA) and inside, correspondence between the BBKA and the Chemicals Regulation Directorate (CRD).

In my article, I called on Defra and Fera to implement a strategy that requires farmers to report the sowing of seed treated with systemic pesticides.¹ I wrote to Defra in May with this proposal, suggesting that Fera would be a suitable central point to collect and make this information available online. Defra have replied that: *There is no intention at this stage to introduce a mandatory reporting requirement.* Needless to say this was disappointing, but not unexpected. The aim of this article is to explain the reasons for my request.

Systemic insecticides: background

Systemic pesticides are applied to seed as a dressing, so that the active substance permeates the plant during the growing season and acts on any insect that feeds on the plant and so provides 'plant protection'. One-third of UK arable land in 2010 was sown with

seed treated with systemic pesticide.²

The active substances in the majority of systemic products are neonicotinoids: clothianidin, thiamethoxam and imidacloprid. They are a neurotoxin to insects, the effect of which is virtually irreversible and cumulative.³ Neonicotinoids are at least 5,000 times more toxic to bees than DDT and a lethal oral or contact dose for a honey bee is in the order of nanograms (billionths of a gram).⁴ From this information and from dosing information⁵ it can be deduced that the toxicity of a single maize or sweet corn seed coated with the Bayer product 'Poncho', contains the equivalent of over 100,000 lethal oral doses (LD50 24h).

Of course, it is not expected that bees will have direct contact with the seed, but they will be exposed to pesticide residues in pollen and nectar, as well as in soil and water. Foraging bees will also take pesticide residues back to the hive (Figure 1, re-illustrated from the figure on page 16 of the SETAC Workshop summary).⁶ The use of systemic pesticides has radically changed the approach to pest management. Spray pesticides are applied at the first sign of a pest attack, i.e. reactively. Pesticides which are applied to the seed are used constantly, regardless of whether they are needed or not, i.e. prophylactically. There are many implications to wildlife and the environment by this approach to pest management. The following four points are my main concerns.

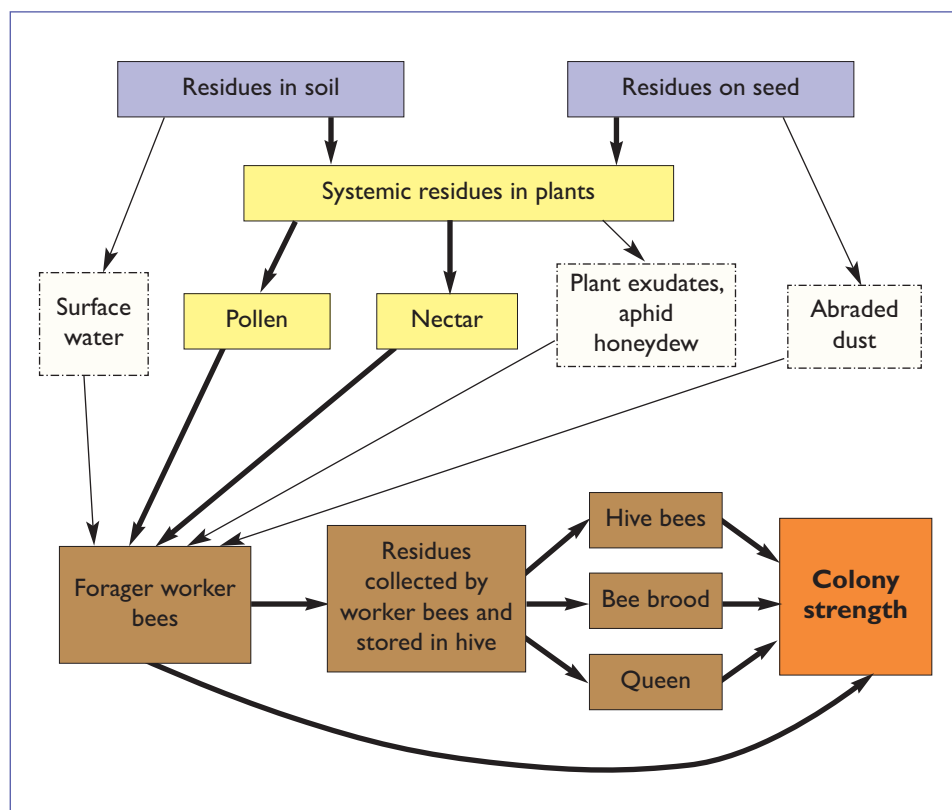


Figure 1. Stressor source, potential routes of exposure, receptors and attribute changes for a systemic pesticide applied to the soil or as a seed dressing (boxes with dashed lines represent secondary routes of exposure).

Figure taken from Fischer and Moriarty, 2011.⁶

1. The pesticide risk-assessment for honey bees is incomplete

The SETAC 'Pesticide Risk Assessment for Pollinators' workshop stated (see pages 20–21) that harmonised toxicity tests (acute and chronic) are still to be developed for systemic insecticides.⁶ The research recommendations, summarised from pages 39–41 in Table 1,⁶ ought to have been identified and investigated much earlier. Clothianidin, for example, was approved for use as an active substance in 2002. The Advisory Committee on Pesticides (ACP) Annual Open Meeting in November 2011 made the same observations and said it might be another five years before a standardised test for chronic bee toxicity guideline will be developed.⁷

The European Food Safety Authority (EFSA) recently published an opinion on the science behind the development of a risk-assessment of plant protection products on bees. In the summary they identified a number of areas where the existing risk-assessment could be improved, including: the methods of field testing;

Table I. Summary of SETAC Workshop Research and Recommendations

Research item	Comments
1. Exposure nomogram for pesticide concentrations in pollen and nectar	To predict pesticide residues in pollen and nectar compared with pesticide application on seeds.
3. Likelihood & magnitude of pesticide exposure through guttation	To determine if plant guttation drops are a pesticide exposure route for bees.
4. Pesticide fate within the colony	To determine the movement, distribution and breakdown of pesticides in the colony and effects on the bee castes.
5. Modification and validation of larval test	A test for the effect of pesticides on bee larvae. A test has already been partly validated.
6. Standardized protocol for chronic feeding study	The need for a standard procedure for a chronic feeding study with adult bees.
7. Testing method to assess effects on foraging behaviour	Further research on methods to evaluate potential pesticide effects on bee foraging behaviour.
10. Improvements to monitoring efforts	Reporting schemes for better collection and analysis of field experiences, including incident reporting.
11. Research on effects of pesticides on community or landscape populations	To better understand the impact of pesticides on the environment. Does not specify, but should include soil & water.

Table I. SETAC workshop research recommendations summarised. From Fischer and Moriarty, 2011, pp39–41.⁶

testing of the presence and fate of pesticide residues; gaps in knowledge of sub-lethal doses and long-term effects of pesticides on bees; the unsuitability of conventional regulatory tests based on acute toxicity for assessing risks of long-term exposure, and improvements to existing laboratory, semi-field and field testing.⁸ These statements clearly indicate that the original risk-assessment that resulted in the approval of neonicotinoids as the active substance for insecticides was inadequate.

2. Conflicting opinions on the effect of neonicotinoids on bees

CRD's reply in the July issue of *BBKA News* did not explain their assessment of the fifteen papers they listed, simply stating: 'The body of evidence assessed so far supports the conclusion that neonicotinoids do not threaten honey bee populations.' Some of these papers addressed the shortcomings identified in point 1 above, so why not take the opportunity to give an evaluation of these papers? *Pesticides and Honey Bees: State of the Science* reviews over twice as many papers.⁹ The authors conclude that 'the weight of evidence demonstrates that pesticides are indeed key in explaining honey bee declines, both directly and in tandem with the other two leading factors, pathogens and poor nutrition' (p1). What are beekeepers supposed to make of these conflicting views, if the CRD will not explain its side?

Why did the National Beekeepers' Association of New Zealand (NBKANZ) find it necessary to evaluate Dow Agro-Sciences (NZ) Ltd application to import the insecticide 'Transform'? This insecticide, with active substance 'Sulfoxaflor', is a liquid applied to soil, prior to sowing crops. It is systemic, neurotoxic, highly persistent in soil, soluble and mobile in water. NBKANZ assessed the documentation as inadequate due to the lack of data on the safety and health of bees. It commented: 'One has to ask ... if Dow Agro Sciences has written this application to mislead or are just plainly incompetent in putting together a coherent application.'¹⁰ It should not be necessary for the NBKANZ, or any national beekeeping organisation, to have to check such applications.

3. EU regulation on plant protection products

European Regulation (EC) No. 1107/2009, lays down rules governing plant protection products and the active substances

contained in these products.¹¹ Persistence in the environment is an important criterion and an active substance is defined as 'very persistent' if the half-life in soil exceeds 180 days, yet clothianidin, for example, has a half-life in soil of 545 days.¹² It is therefore surprising that the UK Environment Agency does not routinely test soil and water for neonicotinoids, especially in locations where treated seed is frequently planted.¹³

The Regulation also states that an active substance shall only be approved if it 'will result in a negligible exposure of honey bees, or has no unacceptable acute or chronic effects on colony survival and development, taking into account honeybee larvae and honeybee behaviour.' As there are no internationally agreed test guidelines and the European Community risk-assessment methodology is incomplete in several respects, I contend that neonicotinoids have not been shown to meet these two conditions.

4. Risk managers take the final decision

The EFSA states that the final decision on protection goals needs to be taken by risk managers. EFSA says: 'There is a trade-off between plant protection and protecting the ecosystem services, pollination, hive products and biodiversity. From a farmer's point of view, plant protection may be more important than hive products.' (p10).⁸ In other words, there is a let-out clause in favour of economic factors.

But the SETAC Workshop summary also says that if 'the use of that product is considered efficacious and necessary [i.e. for plant protection], then the regulating authority may seek to manage the potential risk through mitigation.' Risk-mitigation may take the form of label instructions.

For example, Bayer Provado® Ultimate Bug Killer (400ml aerosol spray can) contains 0.1 g Imidacloprid (0.25 g/l). The environmental protection label states 'HIGH RISK TO BEES. Do not apply when blooms are open. APPLY AWAY FROM BEES'. In case you are unfamiliar with the terminology, 'high risk' is worse than 'extremely dangerous'. This product contains enough active substance to kill two million bees (based on a lethal contact dose of 50 ng/bee (LD50 24h). So the risk manager decided in favour of ornamental plant protection and passed responsibility for the protection of bees to the public. This is hardly reassuring, yet there

is no mitigation for systemic products to protect bees.⁷

Discussion

Defra states: 'If such a [reporting] scheme were to be considered it would have to be demonstrated that it was a practical and effective risk mitigation measure.' I do not think there are practical obstacles for farmers to report sowing of treated seed and for Defra to make this information available online. Farmers derive economic benefit from use of pesticides and a report would be relatively easy to make. They would need only to report once per season. The information required should include the name of the crop, the pesticide product, the location and area of the field, and the start and end dates of the growing period. Many farmers already submit information to Defra online.

The Rural Payments Agency (RPA) has a Rural Land Register (RLR) which holds details of all registered land parcels in a digital format. All land must be registered on the RLR for a farmer to be eligible to receive payments from, say, the Single Payment Scheme (SPS). Each field has a unique reference number (Ordnance Survey sheet number and the National Grid field number), usually the mid-point of the field and the size in hectares.¹⁴ Such a scheme might be included in the existing agri-environment schemes administered by Natural England.¹⁵ Defra and CRD state that 'Ministers take the success of bee populations very seriously.' If they are reluctant to enforce such a reporting scheme, perhaps a financial incentive might encourage farmers to cooperate?

Knowledge of the location of seed-treated crops would allow beekeepers to take their own risk-mitigation measures in the siting or moving of colonies if they so wish. Of course in most cases it will not be practical or possible to do so, but without this information we do not even have that option. The value of knowing the location of these crops is similar to the availability of crime statistics maps (no pun intended). In addition, it would provide the opportunity for correlations between bee losses and seed-treated crops.¹⁶

Defra states: 'We will continue to encourage farmers and pesticide users to develop good relationships with their neighbours, including beekeepers.' As spray liaison is more or less moribund in Hampshire and Cornwall, I doubt farmers will volunteer the whereabouts of seed-treated crops, unless they are required or encouraged to report. Until we know which crops are sown with treated seed, beekeepers will be forever arguing about systemic pesticides. Also, it does not help when an agrochemical company promotes its insecticide products as 'bee-friendly' (an oxymoron) or 'bee-safe' (not proven).¹⁷

The SETAC Workshop summary states: 'Growers and beekeepers engage in reciprocal endeavours: it is therefore to the advantage of each to anticipate the concerns of the other. Cooperation and understanding of one another's needs is essential.' Until there is a comprehensive pesticide risk-assessment for bees, I still contend that we are entitled to know the location of crops sown from seed treated with systemic pesticides.

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An Update on Predator Mite Trials

As mentioned in an earlier article in *BBKA News* entitled *Biological Controls in the Beehive*, the Bee Vet has been trialling a species of predatory mite as a means of controlling varroa in the beehive. The trial at Buckfast Abbey began in mid April and at the time of writing this article, it has been running for nineteen weeks. The aim of the work was simple; to assess whether predatory mites have any effect on the varroa population in the hive. We set out by identifying ten hives, five as trial hives and another five as the control hives, at two separate sites. Daily mite drops were counted one week before treating the hives and this was then followed by weekly counts. Thus far, varroa levels in the treated hives have been considerably lower than in the control ones.

Initially there were a couple of obstacles to get past. The predator mites were first administered by placing a cartridge containing them directly into the hive — this cartridge had a small opening that would allow the predatory mites to emerge to feed on the varroa. We quickly found that half of the colonies propolised the tiny hole within days. We also learnt that trying to count varroa mites on floor boards that were covered with the substrate that the predatory mite was living in was a time-consuming and painful task (around four hours per hive!). These lessons learnt, we quickly developed a system of dusting the predatory mites into the hive, leaving the floor boards in place for a couple of days before clearing it.

Varroa drops in the treated hives have remained very stable throughout this trial period, whereas in the control hives, varroa drops have steadily increased through the summer. The difficulties lie in assessing varroa drops in relation to the amount of brood in the hives. Given the strange, unpredictable weather patterns this spring and summer, some of the colonies have had patches of no brood. A couple of colonies have also had to be split due to likelihood of swarming. Nonetheless, the control colonies were treated naturally as the varroa levels did get too high, and this also suggests that the predatory mites look like they are doing the job in the treated hives where varroa levels remained stable.

Having discussed the trial with other beekeepers and sifting through research papers, it was found that to maintain a stable varroa population within the hive you only need to kill 1.5–5% of the varroa population per day over their natural death in order to achieve a balance. Thus a biological control such as predatory mites only needs to have a low efficacy for a long period of time to have a positive effect. This compares favourably against varroacides that may have high immediate efficacy, but very little long-term control. In the next couple of months, we will be consolidating our data on the trial, and will put together proposals on how to further the work being done. We hope to be able to share this information with the beekeeping community soon.

Jon Arul, Bee Vet



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Networking and Other Challenges of doing a PhD in European Foulbrood

I have now been working on my PhD, studying the epidemiology of the serious brood disease European Foulbrood (EFB), for three years, so readers who have been following my progress will know this is the third article to catalogue research progress.

Much of my activity over the past months has involved processing samples supplied by the National Bee Unit's Bee Inspectors. These were either infected adult and larval honey bees, or extracted DNA prepared at Fera taken from a larger project across England and Wales. The aim was to try and uncover epidemiological links between outbreaks of EFB; that is to say, to gain understanding about and explain relationships between geographically disparate outbreaks of EFB. While fundamental to the aims of my project, this is similar to work I have presented in previous articles for *BBKA News* and in the current piece I would like to describe some of my more diverse experiences.

At the end of March and beginning of April this year I attended a Programming for Evolutionary Biology course, at the University of Leipzig in Germany. A highlight of my PhD, this was very different from anything I had experienced before, involving lectures and practical classes from world renowned experts in the use of computer programming to help understand biological problems. The main thrust of the course was the use of various computer languages to perform statistical analyses of data, and to interpret results of 'Next-generation Sequencing.' This type of DNA sequencing is becoming widely used in biological research and allows orders of magnitude more data to be generated about an organism's genetic makeup compared with traditional sequencing technologies. I already have generated some of this data from my study organism, *Melissococcus plutonius* (the causative organism of EFB), and I plan to analyse this with my own computer scripts. However, just as important as the actual course content was the opportunity to talk with professors and students from all over the world about our research, as well as spending three weeks in the beautiful city of Leipzig.

Meeting other academics and forging links for further work has been something of a theme of this year. In March I attended

the COLOSS workshop on EFB at Fera. The meeting gathered together researchers working on EFB in Europe, and participants from Norway, the Netherlands, Switzerland and the UK. It was illuminating to talk about different approaches to EFB control across the continent and to make important contacts. As a direct result of this meeting I am to be the fortunate recipient of a number of samples of *M. plutonius* from the Netherlands, giving me the excellent opportunity to investigate their epidemiological relationships, both within the Netherlands, and possibly in a larger European context. As well as these 'one-off' meetings, we have also had the tremendous luck to have a visiting academic stay with us at the National Bee Unit. Professor Keith Delaplane, of the University of Georgia, USA, is an expert in beekeeping and entomological science. I was present at an enthralling talk he gave to this year's NDB (National Diploma of Beekeeping) class about the potential benefits of polyandry, the mating of a honey bee queen with multiple drones, and viewing honey bees as a superorganism. This means considering the honey bee colony, rather than the individual bee, to be the subject of evolution and this can be extended to think of the colony possessing different 'organs,' such as the brood comb being used to share chemical and other messages. On a more a day-to-day basis we have had many stimulating discussions about beekeeping, academia and the right way to do science.

As already touched upon, building links is invaluable in studying a globally distributed disease like EFB. I, my colleagues and supervisors at Fera, have managed to assemble a range of samples of *M. plutonius* from Scotland, the Republic of Ireland, the Netherlands, France, Denmark, the USA and Thailand, and I hope to get access to a few more over the coming months. I will be using these to try and gain an understanding of global EFB spread. As a consequence of this I have gone back to the library to see how *Apis mellifera*, the Western honey bee, has been dispersed around the globe and how that can help us interpret the concomitant spread of EFB. This sort of historical research was not something I anticipated doing at the start of my project, but I have found it fascinating, and a genuine pleasure. Of particular interest has been the case of the honey bee in America, where the

story starts with its first confirmed introduction from England to the New World in Bermuda, in 1617. The beginnings of honey bee spread through continental North America were in Virginia in the early 1620s (again transported from England). After several more introductions from the Old World, some successful others less so, bees began to make their own way through the woods of the South and Midwest. These bees thrived in their new environment, such that bee trees became a relatively common (and pleasurable) find for pioneers in the nascent USA. These stories are not just of historical interest; I hope to be able to use this sort of information to explain the type of data I might generate from my own international samples.

I am now entering my final year, and will have to submit my thesis in September 2013. While this is a somewhat daunting prospect, I have thoroughly enjoyed my time in York and at Fera, and hope

that my last few months of laboratory work will make some really novel insights into EFB spread and *M. plutonius* biology.

Acknowledgements

My work is supervised by Dr Thorunn Helgason and Professor J Peter W Young at the University of York, Dr Giles Budge and Dr Richard Thwaites at Fera (the Food and Environment Research Agency), and by Bernard Diaper, at BDI (Bee Disease Insurance). The project is funded by a BBSRC CASE studentship in partnership with BDI. My attendance at the Programming for Evolutionary Biology course was generously aided by a grant from the Society for General Microbiology.

Edward Haynes, University of York

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The University of York University Challenge Team, 2012, just prior to our victorious first round match. Photo with permission of ITV Studios Limited.

Researching Bees Using Diagnostic Radioentomology

How often have you gazed at your hives longing to know what was happening deep inside? The only way to assuage your curiosity is to take the hive apart and look isn't it? Well, no actually. A little ingenious thinking and application of his scientific skills showed Mark Greco that it is possible to 'see' inside a hive without dismantling it. In this article Mark explains not only how he achieved this, but how developing his technique now allows him to see inside a single, living bee without causing it any damage. Intrigued? Then read on...

As an avid hobby beekeeper of Australian native bees and European honey bees for more than twenty years, in 2003 I decided to conduct formal scientific research on them at the University of Western Sydney. My research commenced with the Australian native stingless species *Trigona carbonaria* (Fig 1) and *Austroplebeia australis*.



Figure 1. Australian stingless bees (*Trigona carbonaria*) pollinating greenhouse capsicums. All photos by Mark Greco.

I especially wanted to know whether these bees would pollinate crops inside greenhouses. It turned out that the bees improved crop production by up to 24%. The next step was to determine whether the bees could survive long-term confinement inside greenhouses, so I needed a method for observing their colony health while they were pollinating the crops. This proved difficult to do because of their specialised brood structure and the more basic design of the boxes within which they are managed. The boxes follow the neotropical American design of a simple top and bottom box. Adding more difficulty is the fact that the football shaped brood is constructed in the centre of the nest with pollen and honey pots surrounding it (shown in Fig 2). Therefore, observations are difficult because one needs to crack the box open, essentially splitting the brood in half and spilling honey in the process. This method gives little indication of colony health and actually kills many of the tiny (3.5mm) bees in just one observation.

A radiographer's solution

My background as a diagnostic radiographer helped to form the methods I subsequently developed. It seemed obvious to me that a non-invasive way to observe colony health in stingless bees was necessary thus I thought: 'why not put the box in a CT scanner?' I did this and I thought the results were stunning and that they provided very useful information such as honey, wax and pollen volumes but more importantly, I could now measure brood volume (as an indicator for colony health) non-invasively. I could also monitor

changes in hive components and structure over time by repeating the scans at regular intervals. I coined the phrase Diagnostic Radioentomology 'DR' to describe the non-invasive use of X-radiation on insects for diagnostic purposes and it was not long before I applied the new methods to honey bees (Fig 3).

The benefits of 'X-ray vision'

To this day, we still do not have accurate methods for measuring how much honey, wax, pollen or bees are in a honey bee hive without pulling it apart and even then the results are still just estimates. Estimates are OK for beekeeping purposes, however, with the current stresses on our bees creating colony losses, experiments to

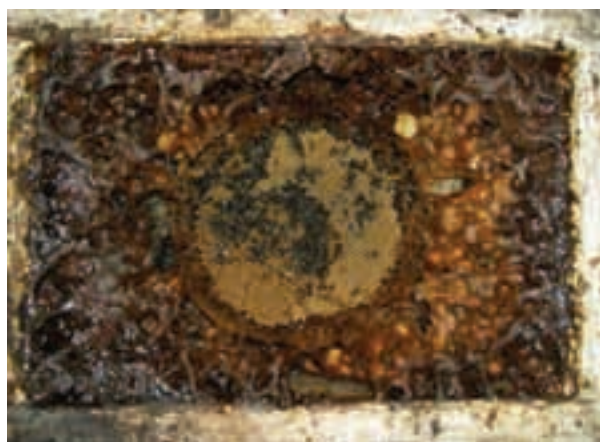


Figure 2. A *Trigona carbonaria* hive showing the central brood chamber with honey and pollen pots surrounding it.

determine the upper and lower thresholds of food stores and pathogen loads require more accurate results. Although the results from scanning live colonies give great visual details of normal in-hive behaviour and nest architecture, scanning the entire colony and digitising the results also means that we can now accurately measure in-hive component volumes and population dynamics non-invasively. The scans can be conducted on healthy or diseased colonies, which can be tracked over time so that changes can be observed

without opening the hive.

We have also been able to 'see' different behaviours and structures to those that have been previously described in the literature. I have observed winter cluster behaviour deep inside the cluster and in-hive honey distribution. Figure 4 shows an indication of what we can expect from research on in-hive components such as sealed vs unsealed brood and pollen, wax and honey



Figure 3. The first honey bee (*Apis mellifera ligustica*) colony to be CT scanned.

volumes. These visual images can be digitised and then the different hive component volumes and their respective ratios can be calculated. Once these are calculated, the volumes can be compared with past or future scans, or sick versus healthy colonies, or colonies on different food resources. Figure 5

shows the level of detail that can be achieved when observing bee behaviour non-invasively after scanning. In this image we can see the vertical foundation wax (green), cell wax (blue) and honey (white). At the bottom right of the image we can see two workers inspecting or cleaning out the base of the cells. There is also one worker bee (red cross on abdomen) that has her proboscis extended and shows evidence of honey in her abdomen. If required, this bee can be tracked over time by marking her and repeating the scans to observe her behaviour. Although standard glass-sided observation hives will continue to be valuable for comb surface observation experiments, these new methods now enable non-invasive 3-D observations of bee behaviour and hive structural changes which occur deep inside a full size hive with all the frames in place. Therefore, the observations are more representative of a normally functioning hive.

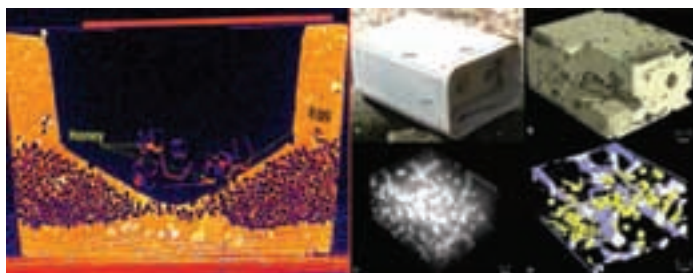


Figure 6. DR scans of a *Bombus terrestris* colony (left) and four views of an *Amegilla holmesi* aggregation (right) in a managed artificial nest.

The new methods can also be used for non-invasive observations of other bee pollinators such as bumblebees *Bombus terrestris* or solitary bees such as the various *Amegilla* species that are managed in artificial nests (Fig 6). The nests of soil or wood dwelling bees have been particularly difficult to study in the past and many nests required complete removal and destruction to conduct full observation experiments. If required, nest architecture and bee behaviour experiments in these managed species can now be conducted without disturbing the hive structures. The nests can be returned to the environment unharmed and the bees are able to continue providing their valuable pollination services.

Multi-uses of CT scanning

As my research continued on internal observation of hives, I started thinking about non-invasive ways to observe the internal parts of a bee. So I thought 'why not put the bee in a MicroCT scanner'.

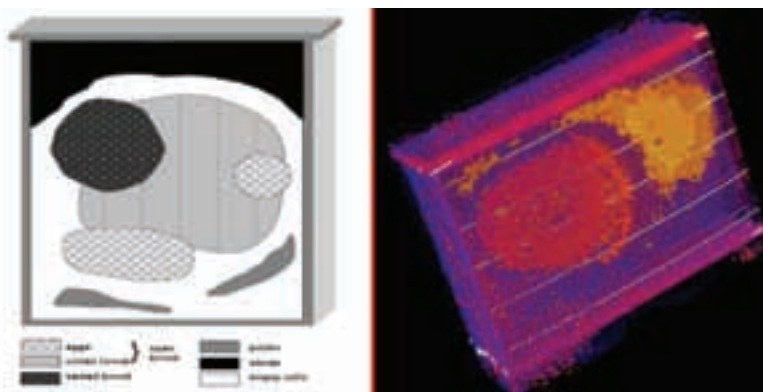


Figure 4. A schematic of hive components (left) and a 3-D scan of what we actually 'see' after DR scanning a honey bee hive.

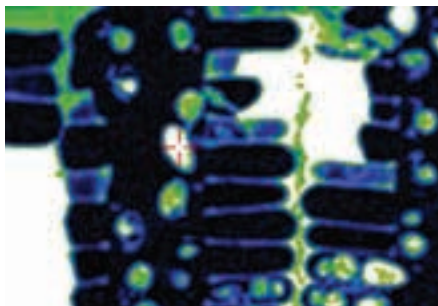


Figure 5. A vertical comb inside a hive containing honey (white). The worker bee (red cross), has her proboscis extended into the honey and has honey in her stomach.

estimation techniques. Also, assessing bee numbers accurately becomes quite difficult when the bees move. The bee movements can also create visual distortions to the image quality. My mathematics and engineering colleagues at the University of Bath are busy working out solutions to these problems using motion correction algorithms and tissue differentiation programs. So, although it is already useful for most insects and their colonies, there is truly great potential for DR to be used as a valuable tool to help us in our understanding of bee morphology, physiology and in behavioural research studies.

I did this and the results were again promising. We can now observe the internal morphology of live or dead bees non-invasively (Fig 7). Also, because we use radiation doses that are of a safe level for insects, for the first time, we were able to conduct physiological experiments on live individual bees without harming them. As a result, studies can now be conducted on an infected individual bee over time with repeated scans enabling the course of disease to be tracked

in that same bee. This method will reduce the inherent errors that occur when using many different individual bees.

DR can also be conducted on valuable specimens such as museum collections or insects trapped in amber or stone without damaging them. The particular specimen in figure 7 (top and middle) turned out to be a previously un-described species (*Proplebeia abdita*) which is approximately twenty million years old. This bee was studied without damaging the amber which contains other inclusions and can be re-examined when required. There are also limitations to DR. For example, the values for the hive component volumes often overlap which results in similar errors to the current

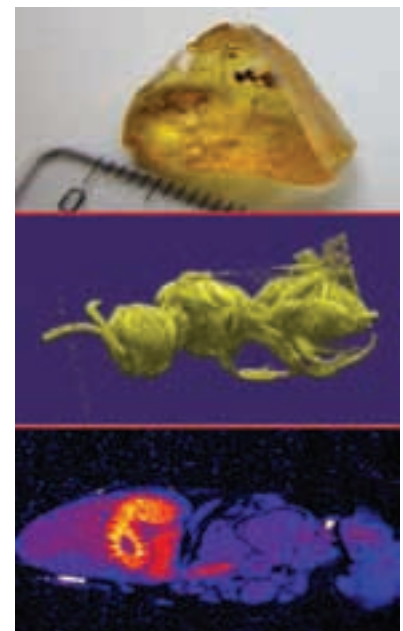


Figure 7. A twenty-million-year old stingless bee trapped in amber (top), a 3-D scan of that bee (middle) and a DR scan of a live honeybee showing orange honey in the ventriculus (bottom).

Mark K Greco,
Department of Biology and Biochemistry,
University of Bath

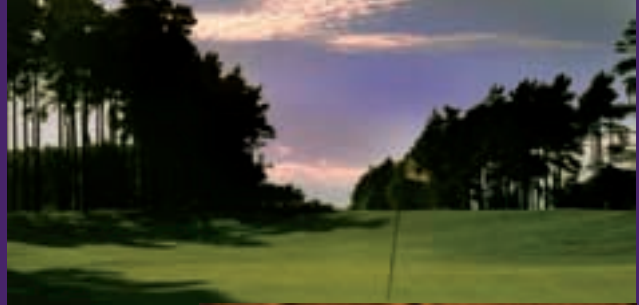
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Honey Bee Health in the EU: European Union Pilot Surveillance Programme

In 2011 the European Commission (EC) appointed the Sophia-Antipolis Laboratory of ANSES (French National Agency for Sanitary Safety of Food, Environment and Labour) as the first EU Reference Laboratory (EURL) for honey bee health. The EURL's activities are wide ranging (<http://www.anses.fr/index.htm>), but its primary mission is the implementation of a Pilot Surveillance Programme (PSP). The PSP's focus is to collect standard baseline data for over winter and within-season colony losses, and to identify any associated risk factors, i.e. particular pests or diseases, across the EU. Last autumn, Member States (MS) received an invitation to participate in the PSP, stipulating monitoring procedures that would have to be rigorously followed in all countries to ensure comparable data at the end of the project.

The NBU responded to this call on behalf of England and Wales, detailing how we could conduct national surveillance to contribute to the EU-wide dataset sought by the EURL. In late May 2012, we received the excellent news that our proposal met all the EC's requirements. We recognise the high importance of the PSP to our understanding of pan-European honey bee health and are delighted to be undertaking this work on behalf of the UK (England and Wales). The other participants are Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Poland, Portugal, Slovak Republic, Spain and Sweden.

The initial PSP meeting, held in Brussels, was attended by representatives from all participating MS. Opening the meeting, the EC Directorate-General for Health and Consumers explained how this is the first time that such a pan-EU surveillance project has ever been undertaken. The EC has allocated €3.3m to achieve this goal. Key to the success of the project is a harmonised approach, to which all MS must adhere. Although a project of this scale will undoubtedly prove complex, the Directorate emphasised the unique opportunity that the EU PSP affords the international beekeeping community — data from this project will be invaluable in informing the EC's decision-making processes at the highest level.

For the purposes of the PSP, each participating country is required to 'target' the whole national beekeeping population in its surveillance regime, and geographical coverage should address the whole country. Sampling must be randomised to include all beekeeping sectors, i.e. professional and hobbyist, and encompass the various urban or rural landscapes found.

The UK's PSP combines the eight beekeeping regions of England and Wales as two, broad geographical zones, termed 'east' and 'west' respectively (Figure 1). Although due to national and regional boundaries, the density of beekeeping is unequal with the west zone comprising a slightly smaller population, this arrangement still ensures coverage across England and Wales, without imposing unrealistic inspection loads on Appointed Bee Inspectors in single regions. It also ensures that sufficient apiaries identified as at risk of exotic pest (small hive beetle and/or *Tropilaelaps* mites) incursion are included in each zone, which is another requirement of the PSP. In climatic terms this zoning

scheme takes into account the large differences in rainfall between eastern and western UK.

One hundred apiaries are being sampled in each zone so the total number of apiaries involved in the England and Wales is two hundred. Having generated a completely randomised list of apiaries from those registered on BeeBase, we have written to selected beekeepers inviting their participation. The first one hundred acceptances from each zone now comprise our sample population. Regarding the number of apiaries in other MS PSPs, these vary between 145 (Portugal) and 396 (France). The total number of apiaries involved across all MS is just 3,571 so if you are one of the UK participants you are in very select company. Our PSP is based on an assumption of pest/pathogen detection of 5% prevalence. This means that we will inspect sufficient hives to detect a pest/disease even if it is only present in 5% of colonies. Since the majority of apiaries in England and Wales comprise nineteen or fewer colonies, in most cases all colonies in an apiary will be sampled (Figure 2). In England and Wales the average number of colonies/apiary is five hives, thus the total sample population equates to about one thousand colonies.

During the PSP, NBU Inspectors will visit each selected apiary three times over a period of ten months, collecting a continuum of information about colony health. The timing of each visit in the PSP will take into account the seasonality of the beekeeping year in the country in question.



Figure 1. Division of England and Wales into two geographical sampling zones (West and East) for the EURL Pilot Surveillance Programme.

The schedule for the UK is:

- ❑ Visit one must take place at the end of the 2012 beekeeping season, before the bees overwinter. In the UK these first visits have already taken place between August and September. In other MS they may have been scheduled earlier or later in the calendar.
- ❑ Visit two takes place at the end of the over-wintering period, which in the UK is March–April 2013.
- ❑ Visit three takes place during the productive beekeeping season, so in July 2013 in the UK.

All apiaries are being monitored for a given list of pests and diseases. Colony sampling procedures and laboratory diagnostics follow standard protocols developed by the EURL, so data from different MS will be directly comparable for use in the EU policy context.

The first apiary visit will be the busiest of the three. First of all the inspector goes through a questionnaire with the beekeeper, recording the apiary's history, its location, e.g. rural farmland, forested, urban, and the type(s) of hive products harvested (honey, pollen, queens etc.). The beekeeper is also asked to describe any colony diseases, disorders or losses observed during the beekeeping season of 2012. Once the questionnaire is completed, colony inspections begin and up to four types of sample may be

The second and third visits in spring and summer 2013 should be comparatively less intense. The inspector will note any lost or ailing colonies and will record obvious symptoms of disease. Although all colonies will be opened and inspected, only sample types (b), (c) or (d) are required.

Adult bee samples from the first visit are now being screened for varroa (absence/presence and level of infestation), *Nosema* and viruses. Diseased brood samples not diagnosed in the field are undergoing confirmatory laboratory testing. Additional screening of unusual beetles or mites is carried out if the small hive beetle or *Tropilaelaps* are suspected.



Figure 2. Top right and above, typically all colonies in an apiary will need to be sampled for the PSP. All photos courtesy of The Food and Environment Research Agency (Fera), Crown Copyright; images supplied by the National Bee Unit at Fera.

taken. The sample types are:

- (a) 300 adult honey bees will be collected from each colony in the apiary, irrespective of whether the colony shows any signs of disease;
- (b) If, upon inspection, any colony does show signs of disease, a smaller sample of 20–30 symptomatic adult bees will also be collected, but only from affected hives;
- (c) If symptoms of disease are seen in the brood, symptomatic bee larvae may be harvested from affected hives; EFB or AFB will be confirmed in the field using lateral flow device (LFD; based on detecting EFB or AFB using specific antibodies) test kits;
- (d) Any unusual beetles or mites observed inside the colony will be sampled individually.

The PSP will run until the end of September 2013. Once analyses are complete, which is anticipated to be December 2013, diagnostic results relating to each apiary will be available to participating beekeepers on the BeeBase database via their personal secure logins. Throughout the project, data will be entered onto the EURL's own secure online-database. The EURL will collate information from all MS to calculate a variety of 'epidemiological indicators' (measures of losses), including: rate of over-winter losses/MS; rate of within season losses/MS; incidence rates for the following pests and pathogens/MS: varroa, deformed wing virus, acute bee paralysis virus, *Nosema*, chronic paralysis, EFB and AFB.

The EC envisages that the PSP will continue on an annual basis and evolve as time goes by. The NBU is fully committed to the delivery of the UK contribution, and the realisation of the EC's aims. We welcome the opportunities the PSP afford us to enhance existing partnerships with our EU colleagues and to forge new ones.

Gay Marris and Mike Brown,
National Bee Unit (NBU)



Do Oilseed Rape Varieties Differ in Nectar Production?

The distinctive yellow flowers of oilseed rape (*Brassica napus*) covered a greater proportion of England than ever before this year. Over the past forty years plant breeders have developed many new varieties of the crop and have been spectacularly successful at improving yields, disease resistance and the quality of the oil and seed meal they produce. It is not surprising then, that beekeepers often ask whether oilseed rape varieties may differ in their potential for honey production, or whether older varieties were superior to newer ones in this regard.

Several investigations in the 1990s looked for differences in nectar production between oilseed rape varieties, but revealed a mixed picture. A study of Canadian spring rape found that both nectar sugar composition and amount per flower were consistent across varieties.¹ In contrast, work in France showed that older varieties yielded much less nectar than the newer varieties that have dominated since the late 1980s with lower erucic acid and glucosinolate levels, though sugar concentrations were not compared.² Meanwhile a study from 1991 concluded that the composition of nectar sugars varied considerably between varieties, with ratios of glucose to fructose ranging from 0.82 to 1.74, indicating that the crystallisation properties of their honeys will vary.³

New oilseed rape varieties are released into the market every year, and the most successful are planted on up to a quarter of the crop's total area before they are superseded within a few years. Growers can choose between open-pollinated varieties (produced from a line of self-fertilising parents) or hybrids (produced from controlled crosses of two parental lines). But among today's high yielding varieties some have new traits, such as shorter (semi-dwarf) stature and non-transgenic herbicide-tolerance. The advent of these new characteristics, and the mix of new varieties that are planted in our landscapes, mean it is pertinent to re-examine whether varieties differ in their nectar production.

Research is underway at Rothamsted Research in Hertfordshire to address this question. My PhD project aims to compare the quantity and composition of nectar sugar produced by a wide range of oilseed rape varieties. This will give an insight into their granulation properties and their value to honey bees and other pollinators as food sources. I am particularly interested in whether open-pollinated, hybrid or semi-dwarf varieties show a general tendency toward higher or lower nectar production. I will also investigate whether varieties differ in the protein content and fatty acid profile of their pollens. Potential differences between varieties may be correlated with pollinator visitation, which I will record. Samples collected between this year's rains are currently

frozen and awaiting analysis. As well as beekeepers, I hope that the findings will be of interest to farmers, who, if they can be encouraged to grow varieties with greater rewards for floral visitors, would also be supporting our populations of bumblebees and solitary bees.

Acknowledgements

I wish to thank Mark Nightingale for kindly allowing me to sample the plants on his field trial, and to the BBSRC and Insect Pollinator Initiative for funding.

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Jon Carruthers with a field of oilseed rape behind.

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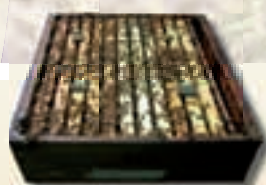
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The BBKA Honey Survey

Please take part in this important record of British honey quantities. Every type of weather has been thrown at us and our bees this year, including of course the wettest summer on record. Because of this there is heightened interest in the effect on honey bees and honey supplies, and we would be very grateful if you could spare five minutes to take part in this year's honey survey and tell us about your experience this year. The information will be used to help us build a picture of this season's honey crop and allow us to make year on year comparisons.

All participants will be entered into a prize draw to win gift vouchers for Thorne's beekeeping equipment or supplies; first prize is a £200 gift voucher and there are two runner-up prizes of £50 gift vouchers.

The easiest way to take part is by going to the BBKA website www.bbka.org.uk/ where you will find the survey online. It should take no more than five minutes to complete. Alternatively you can complete the questionnaire below in ballpoint pen and post it back to us. Whichever way you choose **please reply by Friday 12 October 2012 at the latest**. You will be able to read the survey results in December BBKA News.

This survey is being conducted according to the Market Research Society Code of Conduct. All individual submissions will be treated in confidence. Thank you for taking part.

Dr David Aston, BBKA Chairman

HONEY QUESTIONNAIRE

1. For how many years have you kept bees?

Please write in how many years to the nearest half a year, including this year as half a year if you started beekeeping any time in 2012.

.....years

2. How many colonies/hives do you have?

Please write in how many colonies/hives you either own or were wholly responsible for on 30 September 2012, even if you have had more or fewer colonies/hives at different times of the year.

.....colonies/hives

3. If you keep your colonies at more than one site, please could you tell us how many different sites or apiaries you had on 30 September 2012?

.....apiaries

4. Which if any of the following organisations are you a member of? Please tick all which apply:

- | | |
|--|--------------------------|
| Bee Farmers' Association (BFA) | ☐ |
| British Beekeepers' Association (BBKA) | ☐ |
| Scottish Beekeepers' Association (SBA) | ☐ |
| Ulster Beekeepers' Association (UBKA) | ☐ |
| Welsh Beekeepers' Association (WBKA) | ☐ |
| My local beekeepers' association | ☐ |
| Please write the name | |
| Not a member of any of the above | ☐ |

5. How many lbs of honey did you get this year?

Please write in how much honey you had taken from your hives by 30 September 2012 to the nearest 1lb, including an estimate of how many lbs this will mean if some of your honey is still on frames, but out of the hive, waiting to be drawn off.

If you are a new beekeeper this year and therefore do not have

any honey yet, please just tick the 'new' box for new beekeeper and skip to question 8.

.....lbs ☐ new

6. About how much more or less honey was this than last year?

Please write in how much more or less this is compared to the same time last year to the nearest 1lb in either the 'more' or the 'less' box. If this is roughly the same as last year please put a tick against 'same'.

.....lbs more
.....lbs less
.....same

7. If you had either more or less honey than last year, in your opinion to what do you think this difference is due? If you have the same amount of honey as last year, please go straight to question 8.

Please could you indicate which if any the following factors you think affected your honey quantity and tick all which apply:

- | | |
|--|--------------------------|
| Early spring | ☐ |
| Late spring | ☐ |
| Intense rain/flooding | ☐ |
| Lack of water/drought | ☐ |
| Cold weather | ☐ |
| Hot weather | ☐ |
| Lack of forage | ☐ |
| Disease | ☐ |
| Wasp attack | ☐ |
| Robbing by other bees | ☐ |
| Swarming | ☐ |
| Better beekeeping | ☐ |
| Beekeeping mistakes | ☐ |
| Something else ... if yes, please describe below | ☐ |

.....
.....

8. How much of the following sources of food (nectar and pollen) has been available for your bees in the past year?

	Exceptionally large amt.	Average amt.	Exceptionally lacking amt.	Not applicable or relevant in my area
Garden flowers and shrubs				
Fruit trees in gardens, orchards or parks				
Other types of trees				
Garden vegetables				
Hedgerows				
Heather, moor or heathland				
Farmers' or market gardeners' crops				

Please name the main farmers' or market gardeners' crops for your bees this year in the space below

.....

Some other food source not described above? Please describe these other food sources in the space below

.....

9. How would you describe the type of area you keep your hives in? If you keep your hives in more than one type of place, please tick all which apply to you:

- Urban roof top ☐
- Urban garden or other green area ☐
- Rural roof top ☐
- Rural garden or other green area ☐
- Have apiaries in both rural and urban areas ☐
- Move hives to seasonal crops ☐

10. Some beekeepers have reported unusual behaviour from their bees this year. Which if any of the following have you observed in the past year? Please tick all which apply to you:

- Early swarming, April or earlier ☐
 - Late swarming, July or later ☐
 - Exceptional amount of varroa ☐
 - Exceptional amount of propolis ☐
 - Exceptionally aggressive ☐
 - Not observed any unusual behaviour ☐
 - Something else? ☐
- If yes, please describe in the space below

.....

11. Could you tell us the first section of your postcode? (This information is to help us look at possible geographical patterns of honey quantities.)

First 4 digits of postcode:

12. Which if any of the following beekeeping-related activities have you taken part in, in the past year up to and including 30 September 2012, either with your local association, the BBKA or in some other way?

Please tick all which apply.

	With my local association	With the BBKA	Through another route
Hired a honey spinner			
Been called on to collect a swarm for someone else			
Attended some form of training event			
Given some form of training			
Attended some form of social event			
Helped to organise some form of social event			
Demonstrated beekeeping, honey making or other bee-related activity, such as candle making			
Sold my own or someone else's local honey			

Would you like to be entered into the prize draw to win up to £200 worth of Thorne's beekeeping equipment?

1st prize is £200 Thorne's gift voucher; two runner-up prizes of £50 Thorne's gift vouchers each.

Please tick one box: Yes please ☐
No thanks ☐

If you have ticked the yes box for the prize draw, please give the telephone number or e-mail address we can use to contact you if you have won the prize draw.

We will use this information for the prize draw and for no other purpose.

THANK YOU FOR TAKING PART

Returning your entries

By paper and post:

Cut out this page, complete it with a ballpoint pen and post it in an envelope back to the following address:

The BBKA Honey Survey
BBKA
National Beekeeping Centre,
Stoneleigh Park,
Kenilworth,
Warwickshire,
CV8 2LG

Online:

Go to the BBKA's web site <http://www.bbka.org.uk> where you will find this survey.

Deadline for entries:

All entries must be received by Friday 12 October 2012 at the latest.

Selling Value-added Cosmetics Made With Bee Products

If you are considering selling bee products this is an article not to be missed. It provides all the information you will need to comply with current EU regulations from the experts.

Introduction

Making your own cosmetics is enjoyable and can also be profitable. Cosmetics can be made with beeswax, honey, propolis and royal jelly. Bee products add a number of qualities to cosmetics including anti-aging¹ and anti-microbial² properties. Additionally, bee products make cosmetics more emollient, skin protecting and skin conditioning. Bee products can be added to soaps, creams and lip balm recipes to create beekeeping value-added products to sell with your honey (see Figure 1). This article provides useful information for beekeepers who wish to sell value-added cosmetics.

Selling cosmetics

In order to sell value-added cosmetics made with bee products legally, you will need to comply with United Kingdom (UK) regulations. As a member of the European Union (EU) the sale of cosmetics in the UK is within the EU's jurisdiction. The legislation regulating sales of cosmetics is defined by the European Union's Council Directive 76/768/EEC (27 July 1976), referred to as the 'Cosmetics Directive'.³ The Directive defines the laws of the EU Member States relating to cosmetic products. The purpose of the legislation is to provide protection to the public by assessing the safety of cosmetics on the market, as well as to facilitate the free movement of cosmetics within the EU's market. All cosmetics sold in the EU must comply with the Cosmetics Directive; regulations apply to large companies and small-scale producers alike. Most beekeepers making cosmetics will be small-scale producers and must, therefore, comply with the Cosmetics Directive.

European Union cosmetics directive

The first step in complying with the EU legislation is to demonstrate that a cosmetic is safe to use. It is the responsibility of the manufacturer to demonstrate the cosmetics they produce are safe before the product is placed on the market for sale. In order for beekeepers to meet this requirement of the Cosmetics Directive, they will need to commission an expert scientific safety assessment before their products are put on sale. Once a product has passed a safety assessment it can be sold within the EU. In addition to the safety assessment a number of other documents are also required to form the Product Information File (PIF); these include records of batches made, material safety data sheets (MSDS) for the ingredients used and a brief description of the manufacturing process. MSDS are available from suppliers and the other paperwork can be produced quite simply by the manufacturer.

Assessment process

The first stage is developing and perfecting recipes for your products. Once you are happy with your recipes and are making cosmetics you are happy with, you should contact a cosmetic safety assessor. The assessor will need a copy of your recipes which specify the amount of each ingredient used as well as the method you use to prepare the product. For soaps and oil-based products, such as lip balms and body butters, the assessment process is very straightforward. The assessor will examine your recipes and generate the assessment document for you from the recipes. There should be no requirement for a sample to be sent to the assessor. The recipe and method of manufacturing is all the assessor needs. The safety assessor will provide a legal document, which contains the recipes for the products assessed and the ingredients which can be used in the manufacturing of



Figure 1 shows a selection of value-added cosmetics made with bee products. Clockwise, from left to right: Dandelion Honey Soap, Honey Bee Soap, Anti-oxidant Lip Remedy, Buckwheat Honey Cerate, Honey Bath Bomb, Sugar Plum Kiss Lip Balm, and Witch Hazel and Propolis Moisture Cream.

the product. The safety assessment certificate is your documentation that the product you are producing with bee products is safe and can be legally sold in the EU. You are restricted by the recipe, ingredients listed and method described in the safety assessment. This concludes the process for non-aqueous products, such as soaps, lip balms and body butters.

The cost of having cosmetics assessed can vary. Over the years the cost has decreased and more convenient packages are available. The assessment is a one-off cost and can be seen as an investment. Safety assessors can be hired to assess a single recipe or to write a more flexible assessment. The cost of the assessment will increase as the number of ingredients increases. Some assessors also provide package discounts. For instance a beekeeper can buy a Beekeeper's Safety Assessment to make a number of oil-based products, such as lip balms and body butters, as well as a selection of cold processed soaps for £199. More flexible safety assessments will include a list of ingredients, which can be added to the recipes included in the assessment, to make a variety of cosmetic products. These additional ingredients will include botanicals, cosmetic colours, bee products, essential oils and fragrance oils.

Products containing a significant amount of water are treated differently in the assessment process than those which do not

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contain appreciable amounts of water. The addition of water to cosmetics can facilitate growth of micro-organisms and this microbial contamination is considered a threat to the consumer. As a result, aqueous products require a preservative system to inhibit the growth of micro-organisms. It is the responsibility of the manufacturer to demonstrate a product will not support growth of bacteria, mould and other micro-organisms. If you wish to make and sell aqueous cosmetics with bee products, including creams, lotions, and bubble baths, the safety assessment process often will include an additional process called a challenge test.

Challenge test

In addition to providing the recipe and method of manufacturing to the safety assessor, a sample of the product needs to be assessed for susceptibility to microbial contamination. Because of the risk of contamination by micro-organisms in aqueous products, the safety assessor will often require a challenge test of these products to ensure the preservative system is adequate to inhibit growth of contaminating microbes. The preservative system is particularly important in aqueous cosmetics which also contain honey because the honey can be a nutritional source for contaminating growth. The challenge test costs approximately £130 per product. This is in addition to the cost of the safety assessors fees.

The challenge test refers to the test used to determine the efficacy of the preservative system in an aqueous cosmetic. To have a product tested a laboratory is hired to conduct the test. A sample of the cosmetic is sent to the laboratory and is divided into a number of Petri dishes. A known amount of micro-organisms is added to each Petri dish and the microbial growth monitored over time. In order to pass the challenge test, the preservative system in the cosmetic must inhibit the growth of the added micro-organism for a period of approximately one month. If an aqueous product passes the challenge test, the safety assessor will provide the assessment document which describes the ingredients which can be used and the method of manufacturing for the product.

Cosmetic labelling

While the first step towards selling cosmetics is the safety assessment of the product, the second step is to ensure the cosmetic is labelled correctly for sale in the EU. The Cosmetic Directive also specifies the way in which cosmetics sold in the EU

must be labelled. By labelling cosmetics in a consistent manner throughout the EU the consumer is afforded a second level of protection through transparency and consistency of labelling cosmetic ingredients. It is important the consumer is aware of the ingredients contained in a specific product so they can make informed choices about the product.

Cosmetic labels must contain the following information on an indelible and legible label. Compulsory information includes: name and address of the manufacturer; the amount of product in the container by weight or volume, the minimum durability if less than thirty months, the function of the product, product precautions if they apply and a batch number for the product. The final mandatory component of the label is a list of ingredients written in the the International Nomenclature Cosmetic Ingredients (INCI). INCI names are used to describe cosmetic ingredients on labels in the EU, USA and a number of other countries. The *International Cosmetic Ingredient Dictionary and Handbook*⁴ lists approximately 19,000 cosmetic ingredients and their INCI names. See Table 1 for the INCI names of some ingredients used to make cosmetics.

The legislation requires the labels also to include contact information for manufacturer; a description of the product including the amount and use of the product and finally the exact ingredients contained in the product. For most cosmetics, the final ingredients are the same as the starting ingredients. One exception to this is soap. Soap is made by chemical synthesis so the ingredients in the final cosmetic are different than the ingredients added to the mixing bowl. The synthesized soap ingredients are also listed in INCI names on the cosmetic label, however, the final products of the synthesis are written on the label. Table 2 (overleaf) provides the INCI names for soap made with either sodium hydroxide or potassium hydroxide. Figure 2 shows an example of a cosmetic label for honey soap.

Table 1. Cosmetic ingredients and INCI names

Cosmetic Ingredient	INCI Name
Beeswax	<i>Cera Alba</i>
Cocoa Butter	<i>Theobroma Cacao</i> Seed Butter
Coconut Oil	<i>Cocos Nucifera</i> Oil
Honey	Mel
Olive Oil	<i>Olea Europaea</i> Fruit Oil
Palm Oil	<i>Elaeis Guineensis</i> Oil
Propolis Extract	Propolis Extract
Rapeseed Oil	<i>Brassica Campestris</i> Seed Oil
Royal Jelly	Royal Jelly
Sunflower Oil	<i>Helianthus Annuus</i> Seed Oil

Cosmetic ingredients are listed on EU cosmetic labels in the International Nomenclature for Cosmetic Ingredients, also called the ingredients INCI name. In the case of bee products, the INCI name is the same as the common name, for instance beeswax is written as beeswax on the label. Other ingredients use the scientific name for the INCI name. For instance, cocoa butter is written as *theobroma cacao* seed butter.

Handmade Honey Soap

INGREDIENTS: Sodium Cocoate, Sodium Oliviate, Sodium Sunflower Seedate, Sodium Cocoa Butterate, Mel, Propolis and Parfum.

Batch Number

Product Weight g

Manufacturer's Name, Street Address, Town, Post Code

Figure 2. An example of a label for a soap made with coconut oil, olive oil, sunflower oil, cocoa butter, honey, propolis and fragrance. The ingredients are written by INCI name. The weight of the soap is indicated in grams and the label shows the batch number and contact details of the manufacturer.

Ingredients

The ingredients which can be used in cosmetics are regulated by the Cosmetics Directive. The European Commission has a database which contains an inventory of cosmetic ingredients defined by the Cosmetic Directive. The Cosmetic Ingredients Database (CosIng) has information about each of the ingredients contained in the Directive as well as opinions of each ingredient by the Scientific Committee for Consumer Safety.⁵ The CosIng Database contains a variety of useful information for each cosmetic ingredient, including the INCI name, a description of the ingredient, as well as the functions the ingredient plays in cosmetic preparations. The CosIng Database is very useful when formulating cosmetics and for preparing cosmetic labels.

Table 2. Soap ingredients and the INCI name of the sodium or potassium salt

Soap Ingredient	Sodium Soap	Potassium Soap
Beeswax	Sodium Beeswax	Potassium Beeswax
Cocoa Butter	Sodium Cocoa Butterate	Potassium Cocoa Butterate
Coconut Oil	Sodium Cocoate	Potassium Cocoate
Honey	Mel	Mel
Hydroxide (Sodium or Potassium)	Not Present	Not Present
Olive Oil	Sodium Olivat	Potassium Olivat
Palm Oil	Sodium Palmate	Potassium Palmate
Propolis Extract	Propolis Extract	Propolis Extract
Rapeseed Oil	Sodium Rapeseedate	Sodium Rapeseedate
Sunflower Oil	Sodium Sunflower Seedate	Potassium Sunflower Seedate

Table 2. The chemical reaction that produces soap is the saponification reaction. Oils, fats and waxes are mixed with hydroxide to produce soap and glycerine. In this process the original ingredients are consumed and new ingredients produced. When soap is made, the hydroxide becomes part of the products and so is not included on the ingredient label. Glycerine is a by-product and is often not listed on the ingredient label. The main product of the saponification reaction is soap. Soap is a salt and the salt produced depends upon which form of hydroxide is used. Sodium hydroxide is used to make bar soap and the soap is a sodium salt. Potassium hydroxide is used to make liquid soap and results in a potassium salt soap. Coconut oil reacted with sodium hydroxide makes sodium cocoate and when reacted with potassium hydroxide makes potassium cocoate. Ingredients added to the soap mixture which do not participate in the chemical reaction are listed by the original ingredients INCI name. Ingredients which do not participate in the chemistry include: honey, propolis, colours and fragrances.

The Cosmetic Directive can also be used to identify substances prohibited in cosmetic formulations. Prohibited ingredients are contained in Annex II of the Cosmetic Directive.⁶ While some substances are prohibited, other ingredients are restricted or specified for particular uses in cosmetics. The restricted substances are listed in Annex III.⁷ Categories of approved ingredients used in cosmetics are also contained in the Directive. Annex IV⁸ is a list of colourings which have been authorised for cosmetic use and Annex V⁹ defines cosmetic preservatives approved for use. The final ingredient used in cosmetics which needs to be considered is added fragrance. Perfumes, including fragrance oils and essential oils can be used at specific concentrations and must be indicated on the label. If the perfume contains any allergens, these should also be indicated on the label for the consumer.

For the most part, beekeepers making value-added products will be using very basic cosmetic ingredients and will be very unlikely to include prohibited ingredients in their products. The CosIng Database can be very helpful for choosing ingredients including colours, preservatives and to prepare labels using INCI names.

New regulations

In July 2013 a new series of cosmetic regulations¹⁰ come into force to replace the existing directive. The major difference for small-scale producers will be the replacement of the cosmetic safety assessment by the new Cosmetic Product Safety Report. For small-scale producers, including beekeepers, the associated fees will be similar to those currently charged. Those holding Safety Assessments should contact their safety assessor to update their safety documents to the new Cosmetic Product Safety Report. There will probably be a charge associated with changing the documents, but beekeepers holding the Beekeeper's Safety Assessment Package will be updated at no charge to the Cosmetic Product Safety Report.

Conclusions

Adding bee products to cosmetics, results in emollient, natural skin care products which are highly desirable in today's market. Value-added cosmetics make a wonderful complement to honey and can increase beekeepers' incomes. While compliance with EU

legislation regulating the sales of cosmetics is mandatory, compliance is not difficult once you know where to begin. Cosmetics containing bee products can be legally sold by following the steps mentioned in this article.

Dr Sara Robb,

Bath Potions Ltd., London

www.bathpotions.com

Scott Grainger

Cosmetic Safety Consultants Ltd, County Durham

www.cosmeticsafetyassessment.com

References:

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3. European Commission. COUNCIL DIRECTIVE of 27 July 1976 on the approximation of the laws of the Member States relating to cosmetic products (76/768/EEC).
4. Personal Care Products Council, USA. *International Cosmetic Ingredient Dictionary & Handbook*, 14th Edition, 2012.
5. European Commission. *Database of Cosmetic ingredients: CosIng Database* see <http://ec.europa.eu/consumers/cosmetics/cosing/>
6. European Commission. *Database of Cosmetic ingredients: CosIng Database Annex II: List of Substances Prohibited in Cosmetic Products*.
7. European Commission. *Database of Cosmetic ingredients: CosIng Database Annex III: List of Substances Which Cosmetic Products Must Not Contain Except Subject to the Restrictions Laid Down*.
8. European Commission *Database of Cosmetic ingredients: CosIng Database Annex IV: List of Colorants Allowed in Cosmetic Products*.
9. European Commission. *Database of Cosmetic ingredients: CosIng Database Annex V: List of Preservatives Allowed in Cosmetic Products*.
10. Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 on Cosmetic Products.

On the Bookshelf: Beauty and the Bees

Dr Sara Robb
Northern Bee Books
£13.50 post paid

Beauty and the Bees, by Dr Sara Robb, is the follow-up volume to her highly successful *Honey Potions* and shows how honey, beeswax and propolis can be used to decrease the signs of aging. In its 120 pages she explains how bee products, in particular honey, are valuable as dietary supplements, as functional foods, in home remedies and in cosmetics. Substituting some of the sugar in your diet with honey will, it is claimed, significantly increase your physiological levels of anti-oxidants and slow the aging process.

A wide range of high anti-oxidant honey recipes are provided, including sweet and savoury honey recipes, honey baked goods and confections.

Many books have in the past made aging-related claims for the value of honey in the diet but *Beauty and the Bees* is somewhat different in that the importance of honey as a functional food is supported by an impressive research bibliography and is written by an author who has an impressive academic background both in America and the UK.

Those of us not in the first flush of youth could benefit from the advice in the volume and all beekeepers who supply honey to others should consider purchasing this book, which may well increase their customer footfall and subsequent honey sales.



IBRA Announces Eva Crane Awardees

A paper written by a team of researchers from the Universidad Nacional de Mar del Plata, Argentina, has been awarded the Eva Crane Award by the International Bee Research Association (IBRA) as the best paper published in its *Journal of Apicultural Research* during 2011.

Among the possible culprits of recent worldwide losses of honey bee colonies one focus of attention has been the gut parasite, *Nosema*. One species of this microsporidium, a type of primitive fungus, *Nosema apis* has long been known to be a minor problem for honey bees, but more recently a different species, *Nosema ceranae* has been found widespread in honey bees.

The importance of *N. ceranae* remains controversial, with scientists in Spain linking it to extensive colony losses, while elsewhere, including in the UK, it seems to have little effect. One explanation for these differences might be that different geographical regions have different strains of the organism, but environmental factors, such as the nutrition of the bee might also be important.

In the award-winning paper, the scientists, led by PhD student Martín Porrini, found that the development of spores of *N. ceranae* was affected by the food given to the host bee. They found that the disease developed more rapidly in bees fed syrup with pollen compared to bees fed syrup alone. In contrast, they found that the dose of spores fed to the bees to initiate the disease was less important.

IBRA Science Director and JAR Senior Editor Norman Carreck says: 'IBRA is pleased to have published this paper by a young researcher, which throws light on this enigmatic honey bee disease. More work is clearly needed to understand the full implications of these findings, but they will undoubtedly influence strategies for dealing with the disease'.

Norman Carreck, IBRA

Solitary Bees: *Colletes* Mining Bees

Most of the nine species of *Colletes* look very similar and are difficult to identify; they are mainly small and brown with pale hairbands. The female builds her nest in the ground and with her short, bilobed tongue she smears each cell with saliva, which hardens to form a waterproof 'cellophane' lining; she then provisions this with nectar and honey before laying her egg and closing the cell.



Colletes hederæ female at nest carrying ivy pollen. Photo by Jeremy Early.

One of the largest and most attractive of the various species is *Colletes hederæ*, sometimes known as the Ivy Bee, because it is only found on ivy flowers in the autumn. It is the latest of all the

bees to emerge, not usually being seen until October and continuing sometimes into December. It is a recent colonist in Britain, having first been found in Dorset in 2000. Since then it has spread all over the south of England, from west Cornwall to east Kent and as far north as Oxford. It seems to be able to multiply very fast; after only two or three years at a site there can be aggregations of tens of thousands of nests.

David Baldock, Bees, Wasps and Ants Recording Society
www.bwars.com

Announcement

The Robert Hammond Award

The Robert Hammond Award for best Intermediate Theory result has been awarded to Wendy Maslin from Beverley in Yorkshire.

Congratulations Wendy!

From the Boardroom

The Executive meeting held on the 1 September began a very busy period for the Executive which culminates in the Annual Delegates' Meeting to be held in January 2013. The organisation of the BBKA Forum being held in October 2012 was discussed. For the Trustees the Forum is one way in which they can meet members from across the country and learn more about their beekeeping and their needs and hear ideas on how the BBKA can best serve its members.

August BBKA News contained an article, which introduced the BBKA's Strategic Plan and the development of the operational plans. This is an ongoing process; the Executive are now starting to look ahead over the coming five- and ten-year periods and consider how best to ensure the future of the BBKA and its role in representing the interests of the honey bee and beekeepers. These are early days and working with the membership we believe in the need to plan ahead.

The activities of the BBKA carried out

on your behalf are varied and extensive, and as we extend the scope of our activities mainly as a response to demands placed on the association we have to be very focussed on how we use the resources available to us. In other words we have started the process of preparing the budget for next year. Member subscriptions contribute the lion's share of the funds we have available to use. However, much effort is being made to source funding and support from corporate sponsors, the public and others who wish to support the work of the BBKA. Obtaining such funds takes time, and in the current economic climate there are many worthy causes competing for the available funding support.

The Executive also continued its discussions on how to use the various social media resources that are available on the internet and how best these could be used to support the work of the BBKA, help our services to members, raise our profile and respond to the continuing interest being shown by the public to our

honey bees. Despite the fact that many members have access to the internet the Executive is aware that many members do not and that some who do have access prefer to receive communications in printed a format.

Education and training are key elements in the BBKA's work, together with the huge amount of work done by beekeeping associations. The Executive was briefed on the progress of our Training Co-ordinator especially the contacts and discussions he has been able to make with members' co-operation. This is most encouraging. The Executive also heard of the progress being made with other activities being carried out under the aegis of Education and Husbandry.

These notes give members a flavour of what your Executive discussed and progressed, and we will provide updates as further developments are made.

Dr David Aston, BBKA Chairman

BBKA Examinations Board Examination Dates 2013

March 23rd 2013 **Module 1,2,3,6,8 Examinations**
(Applications in by 10th February 2013)

November 9th 2013 **Module 1,2,3,5,7 Examinations**
(Applications in by 30th September 2013)

**Advanced Certificate in Beekeeping Husbandry –
15th/16th June 2013**
(Applications in by 28th February 2013)

**General Certificate in Beekeeping Husbandry and
Microscopy**

Date by arrangement with the Examinations Board Secretary
(Applications in by 28th February 2013. Microscopy Assessment
takes place in autumn)

Basic and Junior Certificate

Date by arrangement with the County Examinations Secretary
(Applications 1 month before assessment)

Exam Talk

- ◆ New junior badge to be presented this year (and also to recent year's candidates)
- ◆ 1,018 Basic Applications this year
- ◆ 31 successful General Husbandry candidates.
- ◆ Certificates and badges will be sent out to Area Association Exam Secretaries on 8 October 2012

Diary of Events

2012

6 October. BBKA Annual Forum at NBC.

13 October. Beekeepers and Microscopes afternoon taster session at Bath University. Further info: www.microbees.co.uk.

13 October. Hampshire BBKA Open Honey Show, Sir Harold Hillier Gardens, Ampfield Romsey as part of National Family Education Week. Info from www.hampshirebeekeepers.org.uk or contact pippabarker@aol.com or 01730 895368

25 October. Central Association of Beekeepers' Social Evening: 'Bringing Science to Beekeepers', National Honey Show. Contact Pat Allen: 01708 220897; pat.allen@btconnect.com; www.cabk.org.uk

26 October. National Diploma in Beekeeping AGM. St. George's College, Weybridge. Info from: M Thomas, Tighnabruaich, Taybridge Terrace, Aberfeldy PH15 5S; email: zyzythomas@waitrose.com

25-27 October. National Honey Show, see p33.

10 November. Essex BKA conference 'Beekeeping in the 21st Century', £20, full details <http://www.harlowbees.co.uk/conference/>

10 November. Hampshire BKA Autumn Convention, Barton Peveril College, Southampton. Speakers: Henk Tennekes (Neonicotinoids), Gia Aradottir (GM), Richard Pettifer (Climate Change); workshops, displays, trade-stands. Info <http://www.hampshirebeekeepers.org.uk> or Jan Roper jan.roper@rya-online.net or Tel: 02380 845875

23-25 November. Central Association of Beekeepers' Stratford Conference: Speakers and dinner. Contact Pat Allen tel: 01708 220897, Email: pat.allen@btconnect.com, web: www.cabk.org.uk

2013

12-14 April. BBKA Spring Convention, Harper Adams University College, Newport, Shropshire.

Classified Directory

The Beekeepers Quarterly

see a sample copy at

<http://beekeepers.peacockmagazines.com>

The Quality Beekeeping magazine

Northern Bee Books

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The 81st National Honey Show 2012

Thursday 25th October – Saturday 27th October 2012

International classes and beekeepers' lecture convention

Photo © John Phipps



See
website & schedule
for this year's
fantastic
programme

St George's College, Weybridge, Surrey KT15 2QS

www.honeyshow.co.uk E-mail: showsec@zbee.com

Imported Bees

Readers are reminded of the BBKA's policy to discourage the importation of queen bees and colonies from outside the UK. Prospective purchasers should satisfy themselves of the origin of bees offered for sale.

KENTQUEENS4U by BEE4U



2012 queens email for a form at
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Your Letters



Dear Ed.

Lead Thieves Stung and Taught a Painful Lesson

Lead thieves picked the wrong premises to steal lead flashing from when they disturbed a roof top honey bee apiary and were duly attacked and chased by the stinging insects.

Sam Baird first knew of a problem when water leaked into his optician's premises in Dundonald in Belfast. A roof inspection revealed vandalised guttering and missing lead flashing, but not all of the lead was removed, some was still rolled up and there was evidence suggesting the vandals were disturbed and abandoned it in 'mid-job'.

His honey bees were the reason for this. The noise and vibration triggered the colony defence response and a 'swarm' of angry bees would have attacked the culprits with multiple stings!! As we know, bees will defend their home and honey with vigour.

Many beekeepers regularly keep empty beehives on roofs to

tempt passing swarms to take up residence. Such a swarm made its home in this bait hive earlier in the summer and being five metres high gathered nectar and pollen unknown to the population below. This was until the lead thieves came into the bees' roof-top territory.



Sam Baird on the roof with his beehive. Photo by Press Eye Ltd.

'Lead vandalism causes so much damage, cost and inconvenience for a few pounds of scrap. I hope lessons have been learned. This is natural justice. As a beekeeper I know how aggressively bees can defend their hive when disturbed. I smile when I think of it, I laugh out loud', he said.

Sam encourages city dwellers to consider rooftop apiaries, for all sorts of reasons. Sam removed the healthy bee hive to allow roofers unmolested access to fix the damage with non-lead flashing. Police are looking for suitably stung suspects so lead thieves beware, there are more rooftop surprises out there!

Sam Baird, Institute of Northern Ireland Beekeepers

Classified Directory

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SPECIAL OFFER from Jean-Luc Colombo - new corporate supporter of the BBKA



Jean-Luc and his wife Anne (pictured with their dog 'Corton') bought their first vineyard - Les Ruchets (the bee-hive) in Cornas, in the heart of the Rhône Valley - in the early 1980s and celebrated their first vintage in 1987. They are renowned for their great wines from the northern & southern Rhône and the Mediterranean region, and export to over fifty countries.

Jean-Luc has great respect for nature, including a sustainable approach to vineyard management and winemaking - key to Colombo's 'green' philosophy. His love of nature is apparent on any visit to his vineyards and he is a great believer in insects, animals and grapes co-existing naturally, allowing all to flourish. This can only be accomplished with sustainable vineyard practices where no harsh pesticides are used. Honey bees pollinate more than 90% of flowering crops and play a vital role in our food chain and Jean-Luc considers the dwindling population to be one of the biggest threats to nature. In recognition of this Jean-Luc named some of this Côtes du Rhône wines 'Les Abeilles' (the bees).


JEAN-LUC COLOMBO - CORNAS

It is a well known fact that in many places around the world the bee colonies are in jeopardy and this is the case in the UK too. As part of his continued support for the honey bee, Jean-Luc Colombo has become a corporate supporter of the BBKA. In addition to a fixed donation, a contribution of £0.10 per bottle will be made to the BBKA for every bottle sold - our aim being to raise in excess of £5,000 per year for the BBKA.

Two wines are made under the colourful 'Les Abeilles' label, a Côtes du Rhône white and red. Both of which are on special offer to members of the BBKA. See below for details.

Les Abeilles Blanc is a fresh, dry white wine made from 80% Clairette and 20% Roussanne. It has a floral, citrus aroma with hints of minerality which carry through to an easy drinking white wine which is balanced, fresh and lively. Jean-Luc loves to match this to sushi or ceviche.

Les Abeilles Rouge is a fruit-driven blend of Grenache, Syrah and Mourvèdre: classic Rhône grape varieties. Seductive, rounded and supple it also shows bright, red fruit, spice and liquorice characters. A great wine to pair with grilled or BBQ lamb or pork - particular favourites for Jean-Luc's BBQ.

For wine loving members of the BBKA we have teamed up with www.cellarviewwines.com to offer you 10% off these bee friendly wines.



Les Abeilles Côtes du Rhône Rouge 2010

Normally £9.99 per 75cl bottle;

Promotional Price £8.99

Les Abeilles Côtes du Rhône Blanc 2011

Normally £8.49 per 75cl bottle;

Promotional price £7.64

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