Bee World

IBRA
INTERNATIONAL BEE RESEARCH ASSOCIATION

Volume 90 | Issue 2 | June 2013 | ISSN: 0005 772X

Contents

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ISSN 0005 772X

Volume 90 Number 2
June 2013

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Bee World is the publication of the International Bee Research Association, containing original articles and features. It welcomes submissions on all aspects of beekeeping and all species of bees world-wide. For further information about this publication please visit the IBRA website.

Designer: Sarah Jones
Layout: Tony Gruba

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Front Cover: *Bombus terrestris* on bramble.

Photo: Janet Craig

Guest Editorial

I'm writing this shortly after the announcement that Europe is to proceed with a temporary ban on neonicotinoids on some agricultural crops visited by bees. I watched events unfolding in the run-up to the EU vote with great dismay. The whole question of neonicotinoids now has very little to do with bees and bee losses - although they are the veneer - and rather it is to do with established views regarding the use of pesticides. My concern is that the goodwill and indeed the name of beekeeping has been hijacked to support an alternative and pre-existing agenda. I don't have any problems with people objecting to pesticides *per se*: I object to the misinformation promoted and to the tactics being used.

The body of science regarding neonics and harm to bees is neither compelling nor conclusive. Field experiences do not reflect the results of laboratory studies. Laboratory studies often use dosages or application/contact methods which are hugely inflated or wholly artificial. The reporting surrounding neonics is very selective. There is no differentiation between assessments of hazard or risk, nor does there appear to be any appetite to understand mitigation strategies or the tangible harm caused by the much cruder insecticides that neonics once replaced.

It is telling that the high-profile, "March of the Beekeepers," protest in London just days before the EU vote had no support from any of the UK beekeeping organisations or bee charities. This is because they too are caught between an appealing, emotive, and accessible fallacy: and the blurred and unclear facts of the situation. It would be so easy for them to jump in feet (mouth?) first and milk yet more public sympathy, perhaps public funding too, but they do not. The message from all these organisations is clear: the biggest challenge for all species of bees is habitat loss and the weather; for honeybees add Varroa and associated viral diseases near the top of the list.

The list of sponsors for this "beekeepers" protest march read as a list of organisations which exist to campaign against pesticide usage. By all means let them organise a protest if they so wish, but do it openly and honestly and do not hide behind bees and beekeepers. To be honest I would much rather hear facts and realistic scenarios from these organisations as to how food will be grown and distributed should all pesticides be banned tomorrow, which appears to be their aim. In the specific case of neonics, I'd like to know how they will prevent older, cruder, insecticides being drawn back into use. Can they provide a realistic and achievable phased exit strategy, rather than some knee-jerk pulling of the rug from under our food supply?

I am used to being labelled as corrupted by the pesticide companies for not joining the clamour to ban neonics. You will forgive me for making sweeping generalisations, but having dealt with a number of anti-pesticide campaigners (both individuals and organisations) on the topic of neonics over recent years, I find their tactics when confronted with a non-believer totally abhorrent, and this has served to harden my position against the "anti" brigade. It appears the right to express an opinion only extends to those who express their preferred opinion; no debate, just agreement. I terminated correspondence with one such individual recently when he summed up his objections to pesticide usage with the comment "I want to live in a world that is guaranteed to be safe."

If this two year ban is to have any bearing on the health and well-being of our bees, we need to know what new information should be obtained that will inform the eventual debate on whether the ban should be continued or lifted. What research will be done during this period to further our understanding of the effects of these pesticides? How will realistic testing for sub-lethal effects, accumulation, degradation, and dispersal be achieved? How can we account for the current disparity between laboratory and field results?

Back in the here and now, Spring has finally sprung in the UK; skies are blue and blossoms are plentiful. Like many I have colonies which are behind in their development and winter losses to make up, on account of the past year's weather. I wish you a season of good weather, abundant forage, manageable Varroa, and plenty of tedious extracting. Keep up the good work, beekeepers!

Daniel Basterfield NDB
Bee Farmer and Member of IBRA Council.

Beekeeping in the Kingdom of Saudi Arabia Past and Present Practices

A. Al-Ghamdi and A. Nuru

The Kingdom of Saudi Arabia is a very large and interesting country about which many people would like to know more. Certainly not a lot has been written about beekeeping here - a situation that *Bee World* hopes to remedy with two articles which look in detail at the current apicultural scene in this vast land and what future developments can be expected.

Introduction

The Kingdom of Saudi Arabia covers 2,250,000 km^2, most of which is lowland plain. However, there are also extensive mountain chains and associated valleys. The Sarawat Mountains (Fig. 1), which range in altitude between 800 and 3,000 metres above sea level, stretch for more than 1,000 km, and are the dominant ones. These mountains have diverse climates and receive adequate rainfall in summer, winter and early spring to support the growth and flowering of a great diversity of plant species that are rich in nectar and pollen for bees. As a result, these mountain chains and their associated valleys are the best potential beekeeping regions of the country.

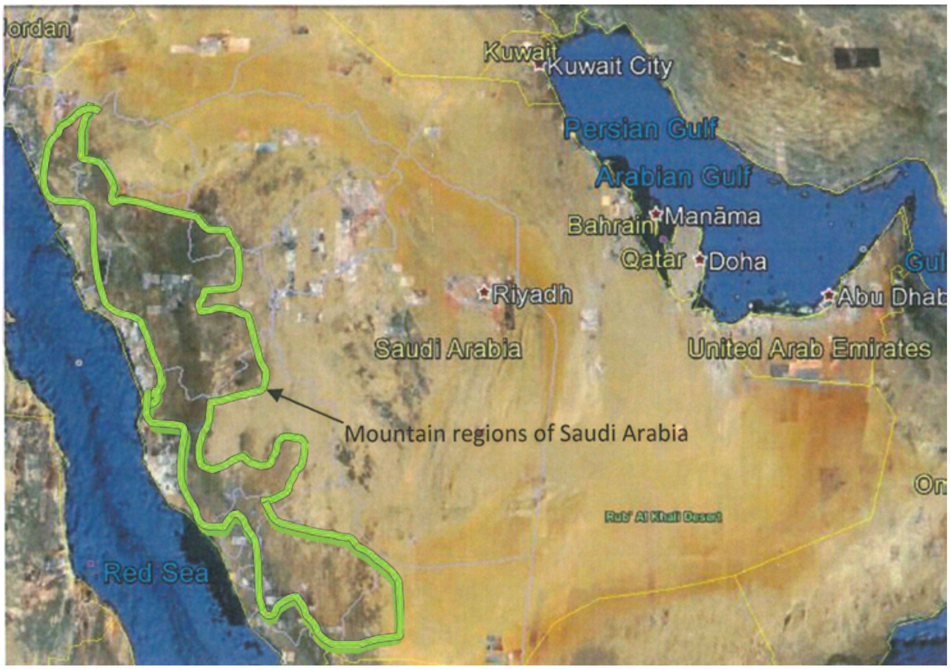


Fig. 1. Map showing south western mountainous regions of Saudi Arabia.

Many works of literature support the theory that the origin and diversification of the honey bee (*Apis mellifera* L.) was in the Near East (Ruttner, 1988; Franck *et al*., 2001), an area that includes present -day Saudi Arabia. These studies indicate that the people of this region may have started to exploit honey from wild nests of *A. mellifera* earlier than in other places. Although written documents that indicate precisely when and where beekeeping started in Saudi Arabia are lacking, the practice can be traced back at least 4,500 years, when the region was much wetter and covered with dense vegetation. It can be easily inferred that during these periods, Beekeeping was widely practised in the areas such as ancient Egypt by about 2500 BC (Crane and Graham, 1985; Crane, 1983). Moreover, the presence of earthen paintings in Iraq that date back to 2000 BC (Crane, 1983) and rock paintings in Eastern Yemen (Giovanni, 2001) also indicate that the beekeeping began long before the Islamic period (Crane, 1990).

The written beekeeping history of Saudi Arabia can be traced back to the beginning of the first century, with references to the "*Arabia Felix"* as a land with plenty of honey (Jabra, 1951). Moreover, some written documents by Bilons (79 AD) referred to the region as one in which honey and beeswax were dominant agricultural products (Tarcissi, 1968).

By the 7th century, the Holy Qur'an included many statements about bees, beekeeping practices and various uses of honey as an important remedy to treat several disorders in humans (Qur'an 16: 68-69) (Giovanni, 2001). This evidence documents a history of honey bee exploitation in the country that extends back at least 1,400 years.

Honey Bee Diversity

Apis mellifera is native to Saudi Arabia. *Apis florea* F. was introduced to the country in 1985; however, *A. mellifera* remains the dominant species. *Apis mellifera jemenitica* is the only race of *A. mellifera* naturally found in the country and traditional beekeeping is mostly practised using this race. *Apis m. jemenitica* is well adapted to the semi-arid to semi-desert conditions in its distribution. The bees are reported to cope well with long dry periods, brief flowering intervals, temperatures up to 40°C, and annual rainfall of just 50-100 ml (Ruttner, 1988).

Many reports have suggested *A. mellifera* originated in Near East Asia, which includes Saudi Arabia. Based on this hypothesis, *A. m. jemenitica* could be ancestral to the other races of *Apis mellifera*. *Apis m. jemenitica* is found both in Asia and Africa and its geographical distribution extends for more than 4,500 km from the Arabian Peninsula via the Horn of Africa to West Africa. In the Arabian Peninsula, *A. m. jemenitica* is found in Saudi Arabia, Yemen and Oman (Ruttner,1988; Hepburn and Radloff, 1998).

Morphometric Characteristics of *A. m. jemenitica*

Apis m. jemenitica is readily identified by its yellow abdomen with grey to brown bands. Morphometrically, it is the smallest race of *Apis mellifera* (Ruttner, 1988). Different populations of *A. m. jemenitica* are reported to exist within its distribution. The Saudi Arabian population race is reported to have the smallest body size (Ruttner, 1988). It is almost the same size as *A. cerana* (Oldroyd and Wongsiri, 2006). Because of its small size, Saudi Arabian populations of *A. m. jemenitica* build on average 25% more worker cells per unit area under natural conditions than European honey bees build on embossed wax foundation sheets (Al-Ghamdi, 2005). Moreover, a recent comparative study by Al-Ghamdi (2006) of morphological and histological characters of Saudi Arabian *A. m. jemenitica* demonstrated that the mean values of morphometric characters such as width of wax gland mirror on sternite 3 (1.95 mm) were smaller than the values (2.05 ± 0.06 mm) reported for *A. m. jemenitica* of Ethiopia (Amssalu *et al.,* 2004).

Behavioural characteristics of the bees

Unlike the populations of *A. m. jemenitica* of Africa, populations in Saudi Arabia are reported to be very gentle and calm (Alqarni, 1995). Alqarni further reported the absence of stinging even after provocation. As a result, Saudi Arabian honey bee hives can be manipulated even during the daytime with minimal protection. The same report indicated the absence of an annual migration in these bees. Moreover, the bees have been reported to have robust grooming and hygienic behaviour, short post-capping durations, and periodical declines in the brood population (Khanbash, 2002; Al-Ghamdi and Hoopingarner, 2002). These behavioural and other biological characteristics confer a certain degree of resistance to *Varroa* mite infestation as reported in many references to *A. cerana* and their resistance to Varroa mites (Oldroyd and Wongsiri, 2006). Although many beekeepers have complained that *A. m. jemenitica* is less adaptable to box hives, Al-Ghamdi (2005) demonstrated that these bees can be easily establish in box hives.

Apis florea

Apis florea is the smallest honey bee species, both in its body size and its single open-nest comb. The main range is in the tropical regions of India and South East Asia, Thailand, Vietnam, Burma (Myanmar) and southern China (Wongsiri *et al*., 1997). It is also found in several Middle Eastern countries including Iran, Iraq and Oman (Peterson, 2011). The bees are highly adapted to hot climatic conditions and their small bodies and colony population size may favour its adaptation to an arid climate and limited forage resources. Currently, *A. florea* distribution is expanding from east to west and is found in many parts of the Arabian Peninsula and in the eastern and central parts of Saudi Arabia. Local beekeepers in Oman have been reported to keep *A. florae* and collect honey but it is not recommended that both species are kept in the same place .They act as carriers of mites into weak *A. mellifera* colonies. At present reports do not cause too much concern as some *Varroa* mites have only been found in weak *A. florae* colonies. Researchers have not found *Euvarroa sinhai* and *E. wongsirii* in *A. florea* in Saudi Arabia and Oman (Peterson, 2011). This theory of Mac Arthur and Wilson (2001)and our hypothesis showed that *A. florea* is the introduced species but left the native parasitic mites at its native home. On this evidence the *A. florea* population will distribute and establish quite successfully in the new habitats of the Arabian Peninsula and Middle Eastern countries.

Current Practices in Saudi Arabia

Beekeeping is practised in most areas of Saudi Arabia, but it is largely concentrated in the south western mountainous regions (Al-Baha to Jizan, Mekkah, Asir, and Al-Medinah). More than 70% of the bee colonies in the Kingdom were estimated to be found in these regions (Fig. 1) (Al-Ghamdi, 2007).

Beekeeping is a long-standing practice in rural Saudi Arabia. It is one of the most important economic activities for these communities. Approximately 5,000 beekeepers maintain more than one million honey bee colonies and produce approximately 9,000 metric tonnes of honey annually (Al-Ghamdi, 2007). More than 70% of the bees are still kept in traditional cylindrical hives made from various locally available materials.

Types of traditional hives used in Saudi Arabia

In Saudi Arabia, different types of traditional hives, including log hives, clay pot hives, and mud hives, are widely used. The log hive is very dominant and usually made from date palm tree trunks (Fig. 2a) and other processed timber. Today, the log hive is precisely designed and assembled in cylindrical form using machine-made timbers (Fig. 2b). To construct one machine-made log hive, about 12 pieces of timber with dimensions of 10 cm × 100 cm) are required. The outer shape of the hive can be either round or rectangular. The hives have openings at both ends with leads.

Many commercial beekeepers still use such traditional hives. Beekeepers prefer traditional hives because of their better insulating properties and because the volume of such hives better matches the colony size of local honey bees than that of box hives. Moreover, beekeepers and consumers believe that honeys from traditional hives are higher in quality because of higher viscosity. Moreover, traditional hive beekeeping practices do not require extra accessory equipment, and the price is inexpensive compared to box hives.

In Saudi Arabia and in many Middle East countries many colonies in traditional hives are kept stacked (Figs. 3 and 4) which is efficient in space and sheltering materials. It also requires less time to inspect and harvest honey. However, such stacking may cause robbing, drifting

Fig. 2a. A hollowed trunk log commonly used in Saudi Arabia .

Fig. 2 b. An assembled log hive from machine-made timber.

bees and could be susceptible to the rapid dissemination of bee diseases.

Modern box hive beekeeping

Along with traditional beekeeping practices, box hive beekeeping with Langstroth-type hives is also widely practised in Saudi Arabia (Fig. 4). However, in most cases, the colony size does not reach to the first super level and the bees do not even fully occupy the base of such hives, due to the brief flowering periods and long conditions of dearth in the area. As a result, beekeepers are currently strongly recommended to use modified box hives with fewer frames.

Honey bee management practices in Saudi Arabia

In traditional hives, colony management is very limited because the nature of the hive does not allow many management activities. However, beekeepers do try to adjust the volume of the hive to the seasonal variation in colony population size by inserting or removing foam or other rounded material that fits the diameter of log hives. The volume of the hive is adjusted by moving the plug of filling material along the cylinder depending on the size of a colony in different seasons. Colonies in box hives rarely expand to the super level, so adding or removing supers is infrequently practised.

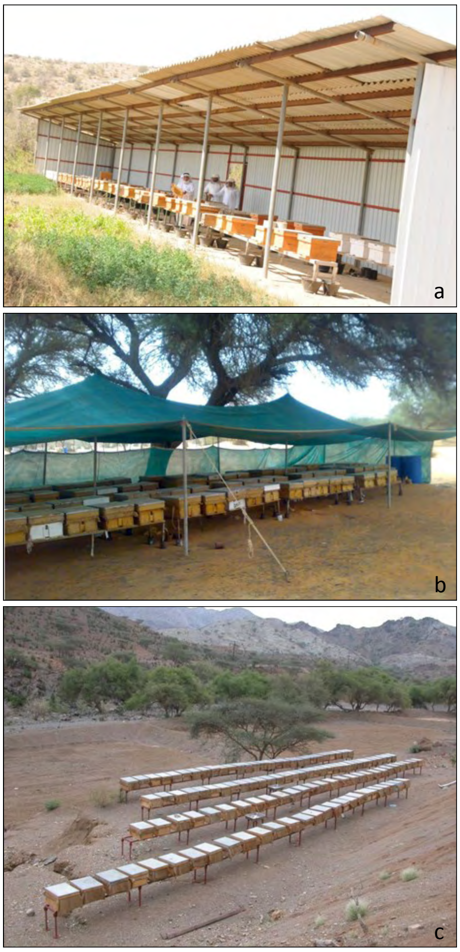
Control of reproductive swarms is not practised with traditional hives. However, beekeepers do try to catch swarms by placing tree branches in front of the apiary so that a new swarm will temporarily rest on the branches and can be re-hived, or by preparing and placing bait hives. Other common management practices include feeding colonies sugar syrup, providing water, and moving colonies to better forage areas. Since the area is very hot in summer many beekeepers cover the hives with some insulating materials.

Hive placement

In most cases, bees are kept in apiaries in backyards or away from homes. For traditional hives, about 30 bee colonies are kept stacked together. The stacks are either permanently fixed (Fig. 4) or placed on mobile stands allowing the colonies to be moved from place to place (Fig. 3). Box hives are kept in permanent apiaries on metal hive stands in several rows (Figs. 5a,b,c). In general, large numbers of colonies are kept in one apiary site, leading to serious overcrowding and resource competition among colonies. Beekeeping is generally practiced as a family business or as large-scale commercial ventures. Some commercial beekeepers manage up to 2,000 bee colonies.

Fig. 3. Apiary with colonies in traditional hives kept stacked together and covered with tent-cloth.

Fig. 4. Colonies in traditional hives kept stacked together in permanent apiary.



Figs. 5a, b, c. Box hives in permanent apiaries.

Migratory beekeeping practices

In many areas of the Kingdom, migratory beekeeping is very common. Seasonal shortages of bee forage and seasonal and geographic differences in bee forage availability drive many beekeepers to move their colonies from one area to another in search of better nectar and pollen resources. Sometimes, 100 or more honey bee colonies are kept on trailers that are towed behind vehicles, allowing migration from place to place (Figs. 6a and b). Beekeepers migrate their bee colonies to follow the flowering of major bee forage plants. Some bee-keepers reported migrating their bees between 3 and 6 times per annum.

Migration sometimes leads to dense concentrations of bee colonies (up to 500 colonies per site; (Fig. 7) in some areas. These colonies may be owned by a single or multiple beekeepers and are


Figs. 6a and b Honey bee colonies kept in trailers and towed behind vehicles for migration.

Fig. 7. Migratory beekeeping site in Saudi Arabia, where up to 500 bee colonies may be kept in one place (up to 30 traditional hives are kept in each stack or block).

placed without consideration for colony density or the actual carrying capacity of the area. Sometimes, beekeepers congregate in areas where a few special plant species grow that yield the most desired and expensive types of honey such as *Ziziphus spina Christi*.

Honey Production

The average annual honey production of a traditional hive is 3-5 kg/annum, while that of a box hive is 5-10 kg/annum. In areas with beekeeping potential there are two or more harvests resulting from multiple flowering periods. In the country, about 9,000 metric tons of honey are produced annually (Al-Ghamdi, 2007). The types of honeys produced in Saudi Arabia are well known according to their seasons and their botanical origins. These types include *Ziziphus* (sider), *Acacia*, *thian, summer* and *majra* honeys. The majority of beekeepers extract honey by the traditional straining method, while some beekeepers, with modern hives extract their honey using honey extractors.

References

Al-Ghamdi, A A; Hoopingarner, R (2002) Studies on different resistant traits of honeybees against *Varroa* mites using model simulation. *Pakistani Entomology* 24(2).

Al-Ghamdi, A A (2005) Comparative study between subspecies of *Apis mellifera* for egg hatching and sealed brood percentage, brood nest temperature and relative humidity, *Pakistan Journal of Biological Science* 8(4): 626-630.

AL-Ghamdi, A A (2005) Settlement and performance of evaluation of *Apis mellifera* in relation to beeswax foundation use in Modern hive. *Pakistani Journal of Biological Sciences* 8(4): 631-635.

Al-Ghamdi, A A (2007a) Beekeeping and honey production in Saudi Arabia. *Fifth Conference of the Arab Beekeepers Association, Tripoli.*

Al-Ghamdi, A A (2010) *Comprehensive study for current beekeeping industry of imported and native honeybee in Kingdom of Saudi Arabia*. (Unpublished report).

Alqarni, A S M (1995) Morphological and biological studies on the native honeybee race (*Apis Mellifera* L., the Carniolan, *A.m. carnica,* Pollmann and their F_1 hybrid. *MSc Thesis King Saudi University.* PP. 43.

Crane, E (1983)*The Archaeology of Beekeeping.* Gerald Duckworth, London.

Crane, E (1990) *Bees and Beekeeping: Science Practice and World Resouces*. Cumstock Pub. Cornell Press, USA.

Crane, E; Graham, A J (1985) Bee hives of the ancient world. *Bee World* 66(1): 23-24.

Jabra, I J (1951) Arabia in Strabon Geography (66BC- 24AD). *Journal of Iraq Scientific Academy.*

Franck, P; Garnery, L; Loiseau, A; Oldroyd, B P; Hepburn, H R; Solignac, M; Cournet, J M (2001) Genetic diversity of the honeybee in Africa: microsatellite and mitochondrial data. *Heredity* 86: 420-430.

Giovanni, C. (2001) Madu Sidir Yaman-Albinanji, bengusaha Madu Yaman Traditional from *Yeman update* 43 (2001) http://madusidir.yolasite.com/pengusaha-madu-yaman-tradisional.php

Hepburn, H R; Radloff, S E (1998) *Honeybees of Africa*. Springer, Germany.

Khanbash, M S (2002) Study the tolerance mechanisms of Yemeni honeybee *Apis mellifera jemenitica* to Varroa jacobsoni Oud. *Journal of natural and applied sciences* 6: 109 -118.

MacArthur, R H; Wilson, E O (2001) *The Theory of Island Biography*. Princton University Press, USA.

Oldroyd, B P; Wongsiri, S (2006) *Asian Honey Bees*. Harvard University Press, USA.

Paterson, S (2011) Beekeeping in the Sultanate of Oman. *American Bee Journal* 10: 875-879.

Ruttner, F (1988) *Biogeography and Taxonomy of Honeybees*. Springer-Verlag, Berlin, Germany.

Tarcissi, A (1968) *Yemen and Arabian Civilization with Geography study*. Dar Maktabat Alhayat, Beirut, Lebanon.

Wongsiri, S; Lekprayoon, C; Thapa, R; Rinderer, T E; Sylvester, H A; Oldroyd, B P; Booncham, U (1997) Comparative Biology of *Apis anderniformis* and *Apis florea* in Thailand. *Bee World* 78(1): 23-35.

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Tayfield Bee-house

Matthew Price

The front cover of last December's issue of *Bee World* (Vol. 89, No. 4) was graced by a picture of an interesting Bee-house in the snow. The photographer was Matthew Price and he has now had an opportunity to look more closely into this interesting piece of history.

Never did I imagine, when walking through the grounds of Tayfield House in Fife, Scotland on a snowy New Year's Day, where my curiosity would take me. Taking a photograph of an unusual wooden building was just the beginning.

As a built heritage conservation officer with Fife Council I was familiar with a wide range of unusual buildings and structures, but this was a new one to me. Located in front of a south facing wall of the walled garden, at first glance it simply looked like a large old garden shed with ornate finials on the gables. But it was the patches of bright colours painted in neat rows along the white painted walls, looking like a strange modern work of art, which I could not understand. I returned later to have a closer look and it became even stranger.

Photo. 1. Tayfield Bee House.

To the front of each patch of colour was a little ledge, behind which was a small slit no more than 2" by ¼" (50mm by 6mm) (Photo. 2). There were sixteen of these, arranged in two neat rows along three sides of the building. I was familiar with dovecots and their rows of flight holes with landing ledges for doves. But these were clearly much too small. Could they be for bees? My suspicions were confirmed when I contacted the International Bee Research Association (IBRA) who maintain the National Bee Bole Register.

Photo. 2. Bee entrance slots and alighting ledges.

There was nothing like it on the register which includes bee-houses and they had not seen the like, but agreed it must be a bee-house. It is now on the register and the original photograph ended up as the cover for the *Bee World* winter edition, 2012.

Tayfield House in Newport-on-Tay, Fife is a fine Tudor style Georgian mansion house incorporating an even older house. Set in landscaped grounds, including ornamental ponds and the walled garden, the estate has been owned and occupied by the Berry family since the 18th century when the first, a John Berry of Bogie, acquired the estate on his marriage. The house, as it is today though, dates from 1828. Over the years each generation has added to the impressive range of planting. Fourth generation William Berry, born in 1864, had a passionate interest in wildlife and was elected to the British Ornithologists' Union in 1897. His son John, born 1907, was the first Director of The Nature Conservancy in Scotland. He contributed notes to the Annals of the Scottish Natural History and The Scottish Naturalist. He was a keen naturalist and lepidopterist, built bug houses and bred tropical butterflies.

Photo. 3. Steele & Brodie Wormit Works during their post WWI brief diversification from making only bee-hives.

Whilst I was waiting to contact the estate to look inside the bee-house and ask what they knew about it, I managed to speak to a former employee of Steele & Brodie, bee-hive manufacturers, whose works used to be just down the road (Photo. 3). I thought there may be a good chance they knew something about the bee house and may even have made it at their works, which would have been an interesting local connection. Checking through their archives, including past catalogues, there was unfortunately no reference to them ever having made this or any other bee-houses, although they made poultry sheds and general joinery work briefly after World War I. The Tayfield Estate confirmed this. The bee-house had in fact arrived by boat, delivered to their nearby pier and ferry terminal in 1850. But unfortunately no more was known. As far as anyone could remember it had always been in its present position located in front of the south-facing wall of the walled garden.

Beekeeping in Scotland follows a long tradition. Pre-Reformation the monks at the Abbey of Aberbrothoc in Angus, for example, needed wax for their altar candles and many of the abbey rents were paid in honey and wax. There is a description in 1678 of the considerable profit derived from the beehives in the district. The important role of bees in pollination however was not fully understood until after 1750 when it was explained by the Irishman Arthur Dobbs. After this they were increasingly placed near flowering fruit trees and bushes, and vegetables such as beans. In John Thomson's *General View of the Agriculture of the County of Fife: with observations on the means of its improvement*, published in 1800, it notes that, whilst honey is not being produced commercially, *'In every garden of almost every gentleman, a few hives of bees are to be seen.'* Beekeeping was certainly not an unusual pastime when, just a few years before the bee-house arrived at Tayfield, Tennyson had written in *Come Down, O Maid* the much quoted lines:

"The moan of doves in immemorial elms
And murmuring of innumerable bees."

Traditionally, additional shelter from the Scottish weather took the form of bee-boles built into south-facing walls

Photo. 4. A traditional straw skep in a bee-bole in the walled garden of Kellie Castle - a Scottish National Trust property.

(Photo. 4). Bee-houses have always been popular in Germany and Eastern Europe where winters are colder and temperatures drop below -20°C for weeks at a time. Even though winters may have been colder in the 1800s it would not have been necessary to protect colonies by placing them indoors during the winter. The early straw or reed skeps were generally left in the bee-boles during the winter without any special protection, although in some cases they may have had simple shutters.

At Tayfield there were no bee-boles and the skeps were free-standing, relying on straw 'hackles' to provide some protection from the rain, so a bee-house would have been of advantage. That said, its acquisition may simply have been a personal whim. Perhaps one was seen on a trip abroad and later ordered by catalogue. However, given the interests of the then head of the family, it seems more likely it was a much less casual acquisition. In England there are some magnificent examples of bee-houses. At Attingham Park in Shropshire there is even an example of one designed by the famous architect John Nash circa 1805 (Grade II listed). Another notable example can be found, at Hall Place Hurley, near Maidenhead, of the late 19th century, restored in 1976, and also Grade II. But bee-houses are by no means common, and certainly not in Scotland.

In Scotland there have been mobile bee-houses on wheels, specially designed for the heather moors, though the Tayfield House example does not appear to have ever been mobile. Indeed the patented Wormit Hive, manufactured by Steele & Brodie was specially designed with features which improved portability when transporting it to and from the Highland heather moors. Incidentally, Steele & Brodie's catalogues show that they also sold the straw skeps up to 1971 (a best quality rye straw skep for £4 plus postage) after which they disappear from the catalogue.

From the spacing and width of the internal shelves it would appear that the Tayfield bee-house used straw skeps although the modern wooden Langstroth style bee-hive with its many advantages effectively replaced the skep from the early 1850s. The slit dimensions would be sufficient (allowing for the removal

Photo. 5. The Steele & Brodie Wormit Works with examples of their hives.

of the build up of paint over the years!) for the bees to enter and yet be narrow enough to deter mice. It is probable that the skeps were then taken out and positioned around the gardens during the summer, the colony having been given a good start to the season within the bee-house.

Note on the local hive makers

Local hive makers Steele & Brodie were founded by Robert Steele in 1875. During the years, until they finally closed in 1998, they manufactured and sold a range of wooden hives, including their own patented Wormit hive (Photo. 5).

Robert Steele's interest in bee keeping began as an eleven year old in Fowlis Easter, Angus when he was given a skep of bees by his aunt. When later he became an apprentice millwright in his father's workshop he began designing and making wooden hives for sale. At that time much was being made of an elaborate octagonal hive made in Ayrshire (The Stewarton Hive). In 1876 at the first show of the Scottish Beekeepers Association in Dundee he exhibited his hive and won all the prizes. He eventually outgrew his father's workshop and moved to Gauldry, Fife.

In 1899 a fire destroyed the building and the business moved to new works built a couple of miles away in Wormit where they remained until they closed in 1998. At one stage after World War I they also made poultry houses and general joinery work. However, a surge in interest in beekeeping between the wars meant they soon returned to making only hives. The business was well located to serve the raspberry growers of Perthshire, Angus and Fife. After World War II they were the only commercial beehive manufacturers to survive in Scotland. After the Wormit Bee-Hive Works closed in 1998, they were demolished and houses, called The Beehives, now stand in their place. Apart from the name, a series of panels in the new brick wall provides a clue to their part, together with Tayfield bee-house, in the history of bee-keeping in Scotland.

Acknowledgements

Special thanks to:
Penny Walker - *International Bee Research Association (IBRA).*
Richard Jones *International Bee Research Association (IBRA).*
Brian Nish - formerly *Steele & Brodie* now with *Thornes (Scotland).*
Stephen Gillespie -*Tayfield Estate.*

References

Bates, D F (1997) *An Introduction to Bee -Houses*. 38 pp.

Crane, E; Walker, P (2001) Winter bee houses and cellars. *Local History Magazine* 86: 10-13; also published in *Beekeepers Quarterly* 68: 12-14 (2002).

Foster, A M (2010) *Bee Boles and Bee Houses.* Shire Books. 32 pp.

Thomson, J (1800) *General View of Agriculture in the County of Fife*. J Moir, London.

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Photo. 6. Decorative panels at the entrance to the new housing development where Steele & Brodie's Beehive Works used to stand.

Words on the bricks, taken from Horace (65BC – 8BC), read:

I, in the style and
Manner of the
Matinaean bee
By labour
Make verses

Beehive and Honey Losses Caused by Bush burning in Adjumani District, Uganda

Moses Chemurot, Patrice Kasangaki, Ojja Francis, Eric Sande and Gilbert Isabirye-Basuta

This paper seeks to quantify numbers of beehives and honey losses together with economic losses accruing annually to beekeepers from the rampant bush burning. The hope is that government agencies can counter any breakdown in livelihood strategies and improve the quality of life of the beekeepers. Environmental degradation caused by burning and roaming of livestock in search for pasture is clearly evident. If these things can be controlled, there is great potential for increased honey production, household incomes and increased local revenue.

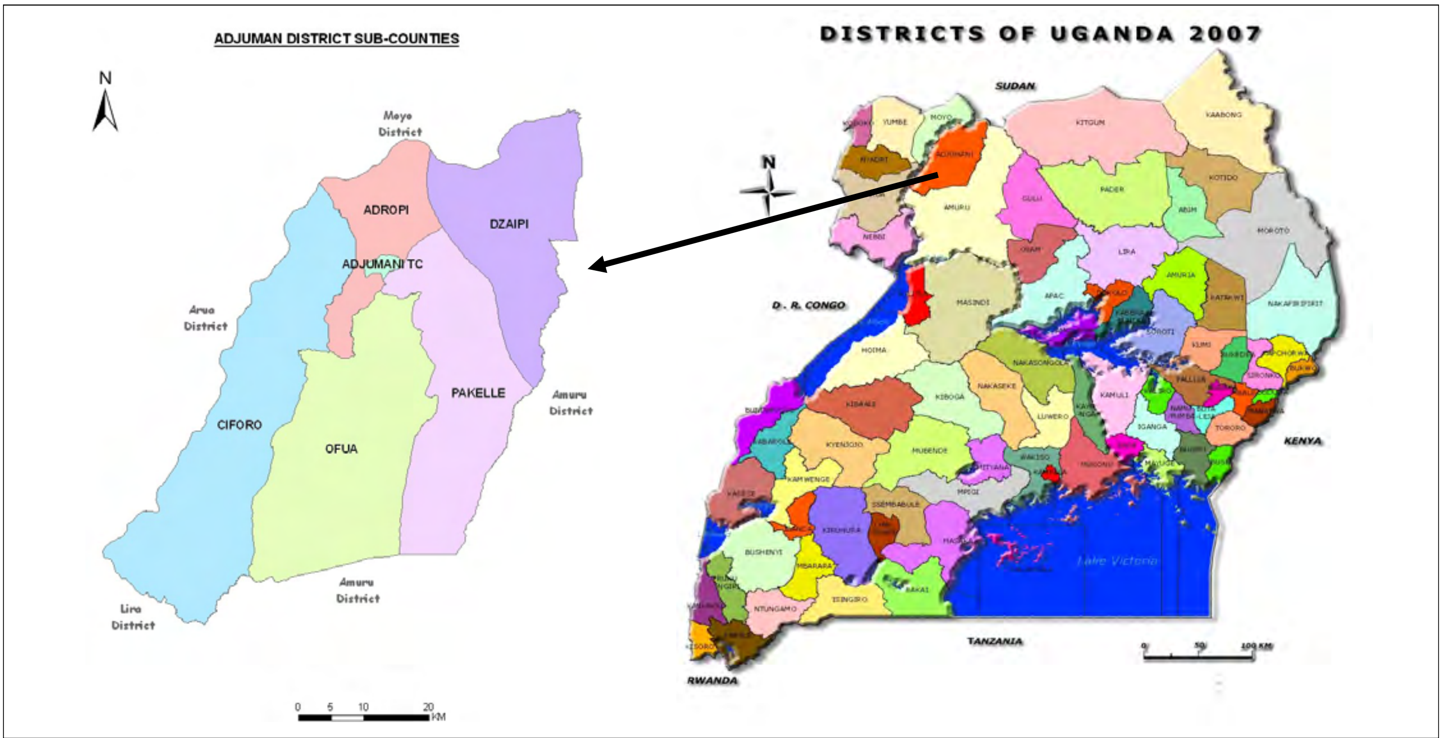

Fig. 1. Map showing the Location of Adjumani District in Uganda.

Introduction

Beekeeping is an important supplementary household income generating enterprise for many African countries. In Uganda, where over 70% of the population earn their living from subsistence agriculture (Nayenga, 2008; Farm-Africa, 2009), beekeeping is being promoted as a key poverty alleviation enterprise. However, several challenges are facing apicultural development. Bush fires over the dry season, among other factors, affect honey production levels (Chemurot, 2011b) and crop production consequently causing food insecurity and poverty (Luggya, 2009).

The government of Uganda, through its Plan for Modernisation of Agriculture (PMA), and more recently National Development Plan (NDP), is trying various approaches to eradicate poverty (NDP, 2010). This includes efforts to promote improved beekeeping practices through programs like National Agricultural Advisory Services (NAADS), Farm Income Enhancement and Forest Conservation (FIEFOC) project and Non Governmental Organisations (NGOs) such as the Danish Refugee Council (DRC), Environmental Alert (EA) and Wildlife Conservation Society (WCS) (Chemurot, 2011a).

Bush burning is rampant over the dry season in districts of Northern Uganda including Adjumani. In some cases, this has caused pollution and disrupted the ecosystems hence affecting farmers' crops leading to food insecurity and poverty (Luggya, 2009). In Adjumani, reduction in honey production due to destruction of bee forage and hives

Photo. 1. An apiary damaged by bush fire (note the completely burnt hives on the ground).

(Chemurot, 2011b) and roaming of livestock has been reported due to widespread bush burning over the dry season. Although there are local efforts to curb bush burning such as enactment of the District Environment Ordinance (DDP, 2010) and sensitization of communities on the control of bush burning, the magnitude of the losses to bush burning among beekeepers has not been documented yet bush burning could be the cause of continued poverty among farmers.

Study area

We conducted this study in Adjumani District between March and May 2011 (part of the major dry season - December to April). Adjumani is located in the North-Western region of Uganda (Fig. 1), between longitude 31°24' and 32°4' East of Greenwich and latitude 2°53' and 3°37' North of the Equator (DDP, 2010). It is bordered in the east by the Albert Nile, in the west and south by Amuru district and in the north by southern Sudan. In 2011 the population was estimated at 331,600 (DDP, 2011).

Sampling

Three sub counties in Adjumani (Ofua, Dzaipi and Pakele) were selected for the study because they vary in the level of honey production. Pakele produces the highest honey volume, Ofua is an average producer while Dzaipi is among the least productive areas (Chemurot, 2011a). Within each sub county, one farmers group was visited by a research assistant who interviewed household heads or any family member (above 18 years).

Farmers were requested to give information on the number of hives lost to bush fires. The average honey yields for the previous year were then used to estimate the quantity of honey lost. The capacities of honey measuring containers used by beekeepers were estimated and always referred to for conversion whenever it was necessary.

Observations

Independent observations were made on beehives destroyed by bush burning and the magnitude of the damage.The data collected were analyzed using Microsoft Excel computer program for descriptive statistics.

Results

Approximately, 29.6% the beekeepers reported a loss of beehives and honey to bush burning (Photos 1 and 2). On average a beekeeper lost 3 beehives per year to bush fires. A total of 387 beehives were lost by 152 farmers sampled. The total projection of the number of hives lost in the district (using the estimated number of beekeepers in the district (1,200) and the percentage of farmers reporting losses (29.6%), per year was 1,067 in the dry season of 2010/2011 alone.

The estimate of honey lost to bush fires (using the mean honey yield per beehive 9.8kg/hive (Chemurot, 2011b) and the estimate of the damaged hives (1067) is a huge loss of 10,456.6 kg of honey. This quantity of honey could have fetched approximately 42 million Uganda Shillings (almost US$17,000) when sold locally in Adjumani.

The number of hives lost to bush burning at sub county level varied with the highest losses being recorded in Pakele Sub County (Table 1). It was surprising to note that no loss was reported by farmers in Dzaipi Sub County and yet this is the driest sub county. Total financial losses due to beehive damage and honey losses were approximately US$3,710 for the 152 farmers sampled (Table 1). The projected annual financial losses due to bush burning (damage to beehives and loss of honey) for the whole district were US$29,271 (Table 2) indicating that the district is losing to bush fires a great amount that would help transform livelihoods and enrich the communities.

Discussion

In Adjumani, close to 30% of the beekeepers reported the loss of beehives and reduced volumes of honey harvested

Photo. 2. A Kenyan top bar hive damaged by bush fire in Adjumani (note the lid on the ground and the box hanging on the tree).

due to bush burning. Losses varied among sub counties but it was surprising that no losses were recorded in Dzaipi Sub County (the driest of all sub counties). This can be attributed to traditional methods of beekeeping where beekeepers deploy hives high to avoid the effects of the rampant bush burning. Another effect bush burning has on production, is the loss of bee forage leading to very low honey production per hive. However, this is not easily understood by farmers. Therefore, much as farmers in Dzaipi did not report financial losses due to bush fires, indirect losses are evident for example low honey yields per hive (Chemurot, 2011a).

The highest financial losses due to bush burning were reported in Pakele Sub County. Pakele is the greatest producer of honey in Adjumani (Chemurot, 2011a) but is also experiencing the highest losses due to bush fires. This can be attributed to the beekeepers in Pakele deploying their beehives at lower heights for easy harvesting. As bush burning intensifies over the relatively dry months (December to April), the beehives in unprotected apiaries are damaged. The consequence of this is that honey production and food security of the district is at risk.

The beehive and honey losses has its impact on poverty alleviation interventions. These impacts can be indirect -loss of bee forage leading to low honey production, but also in the vital loss of bees that pollinate several crops. Since the majority (over 80%) of people in Adjumani district are farmers, realising poverty reduction and economic transformation of households can only be achieved when bush burning has been curbed.

Table 1: Number of hives & financial losses due to fire per Sub County in Adjumani District.

Sub county	Number of farmers assessed	Number of hives lost		Financial loss in Apiculture ($)	
		Total	Mean	Total	Mean
Dzaipi	29	0	0	0	0
Ofua	16	34	2	1,410.5	108.5
Pakele	107	353	3	2,300	71.9
Total	**152**	**387**	**1.7**	**3,710.5**	**60.1**

Table 2: Summary of the estimates of losses to bush burning by all beekeepers in Adjumani.

Projection for whole district			
Household activity	**Percentage of farmers that reported losses to bushfire annually**	**Estimate of number of farmers in district**	**Estimate of total district financial loss ($)**
Bee farming	29.6	1,200	29,271.9

As is evident from this study, concerns about bush burning are relevant as organic honey demands are on the increase country wide and world over. Therefore, efforts to reduce widespread bush burning over the dry season should be intensified. These should include enforcing the environmental laws, District Environment Ordinance and strategic environmental sensitization among communities on the causes, effects and control interventions for bush burning.

Acknowledgements

Special thanks go to P. Olokoko, M. Okello, S. Aliku, A. Maximas, A. Odebasiku and Z. Eberu for their enormous assistance during fieldwork. Thanks to the Local Authorities in Dzaipi, Ofua and Pakele for allowing us to carry out this survey in their areas. Lastly, great thanks also go to farmers in Adjumani for the vital information they supplied.

References

Chemurot, M (2011a). Beekeeping in Adjumani District, Uganda. *Bee World* 88(3): 58-61.

Chemurot, M (2011b). *Beekeeping and financial losses caused by bush fires to farmers in Adjumani District.* Adjumani District Local Government, P.O. Box 2 Adjumani. (Unpublished Field Report).

DDP (2010) *Adjumani District Development Plan 2010/11*. Adjumani District Local Government, P.O. Box 2, Adjumani.

DDP (2011) *Adjumani District Development Plan 2011/12.* Adjumani District Local Government, P.O. Box 2, Adjumani.

Farm-Africa (2009) *Uganda*. Available online: http:www.farmafrica.org.uk/where-we-work/uganda

Luggya, J (2009). Bush burning- An environment threat to Moyo. *The Monitor.*

Nayenga, N R (2008) *Gender dynamics in Agriculture in Uganda: what are the key policy considerations?* https://africaonline.co.ug/finance.go.ug/docs/Policy brief on GenderDynamics in Agriculture in Uganda.pdf

NDP (2010) National Development Plan 2010/11-2014/15.

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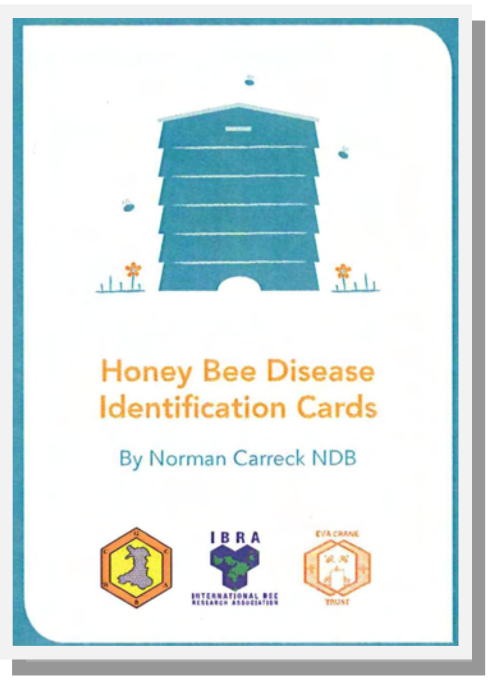

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Unraveling the Complexities of Host-parasite Interactions

By Mark Brown

If we want to understand the interactions between host and parasite species – and such understanding is essential if we want to manage these interactions – we have to step away from simple ideas about single species interactions and dive into the complexity that is biological reality.

"Today, I have a cold". When we think of parasites and diseases, we tend to think in binary units. Even when faced with the huge diversity of parasites and diseases that a honey bee or bumble bee colony can have, we generally focus on single parasites or diseases at a time (although the inextricable linkage between *Varroa destructor* and Deformed Wing Virus erodes such complacency; Martin *et al.,* 2012). However, it has long been known by parasitologists that not only can an individual species, such as the common bumblebee *Bombus terrestris*, host many parasite species, many parasites are also capable of, or rely upon, infecting multiple host species. In fact, best estimates suggest that ~50% of parasite species use more than one host species (Rigaud *et al.,* 2010). Consequently, if we want to understand the interactions between host and parasite species – and such understanding is essential if we want to manage these interactions – we have to step away from simple ideas about single species interactions and dive into the complexity that is biological reality. It is this premise that drives the research in my group (now at Royal Holloway University of London, but previously at Trinity College Dublin).

Our studies in bumble bees are aimed at answering three main questions:

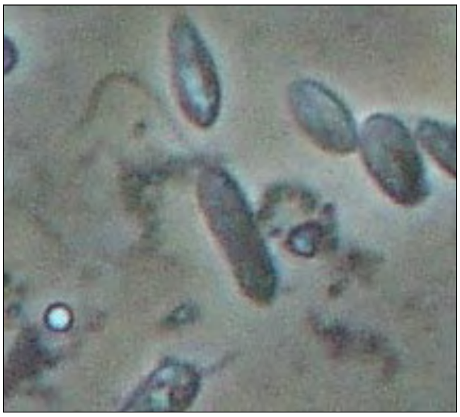
1) Does the broader context of multiple parasites matter for individual host-parasite species interactions?
2) What does a multiple host background mean for the transmission dynamics, ecology and evolution of a parasite?
3) How do these factors affect the evolution of virulence in parasites (that is, the damage that they do to their hosts)?

We have no definitive answers to these questions, and our studies are ongoing, but the research I discuss below is at least giving us some pointers in the right direction.

Bumble bees host a diverse community of parasites, ranging from what were previously thought of as honey bee viruses, through single-celled gut parasites, to multi-cellular worms and parasitoid wasps.

The first study of how this complex community interacted and impacted on bumblebees was carried out in the early bumblebee, *Bombus pratorum* (Rutrecht and Brown, 2008). Spring queens were collected, examined for parasites, and allowed to rear colonies in the lab, enabling individual and population-level

Two everted uteri of the nematode worm, *Sphaerularia bombi*. The white worm is an active parasite, whilst the black worm has been melanised by the immune system of the bumblebee queen in which it was living. Copyright Mike Kelly



The gut trypanosome, *Crithidia bombi.* Copyright Mario X Ruiz-Gonzaléz

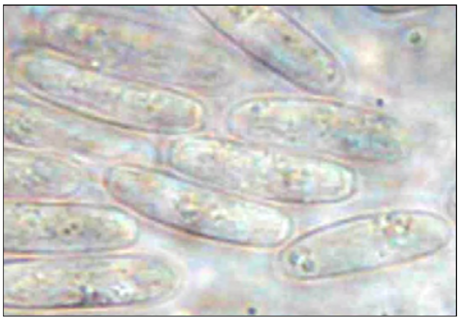
impacts of the parasite assemblage to be examined. A complex, overlapping parasite assemblage broke down into two sections – high and low impact parasites.

High impact parasites (including the nematode worm *Sphaerularia bombi* and the microparasite *Apicystis bombi*), which either castrated or killed queens, knocked out just over a quarter of all spring queens from the potential colony-founding population. The presence of multiple infections meant that this impact at the parasite assemblage level was not a simple additive function of individual parasite prevalence (the proportion of hosts parasitized by a given parasite species). However, as castration and death also removes parasites, the remaining parasite assemblage was significantly simplified, and had no clear impact on colony production, growth or reproductive fitness.

What this study made clear was that focusing on a single parasite in the early bumblebee would give a misleading picture of its impact on individual queens, its effective prevalence in the host population and its impact at the population level. It also has implications for the evolution of parasite virulence. If, as parasite A, you are likely to co-infect a host, and parasite species B with whom you share this host is likely to kill the host before you do, over evolutionary time you will be selected to damage your host more if it increases your chance of reproductive success. Thus, the damage done by any particular parasite is not simply a function of its own interaction with a host, but also the other parasites with which it shares this host. The exact details of such complexity remain to be elucidated.

Switching viewpoints, we can ask how host complexity – the presence of multiple host species – affects the ecology and evolution of individual parasite species. To do this we have focused on two parasite species – the gut trypanosome *Crithidia bombi* and the nematode worm *S. bombi*. When dealing with multiple-host systems, the first question usually centres around host range – how many parasites can the parasite infect? We showed that, whilst *Crithidia bombi* seems to be quite happy to infect any bumblebee species that has been looked at, unlike many microparasites it cannot infect the western honeybee, although the honeybee can vector the parasite between bumblebees (Ruiz-Gonzalez & Brown, 2006). This enabled us to document the potential transmission route of the parasite in the field – a process that involves sitting in flowering meadows, recording bee visits, and then capturing a proportion of the bee population to assess infection levels and genotype parasite strains. Transmission potential turns out to be highly asymmetrical between species (Ruiz-Gonzalez *et al.,* 2012), which is probably a function of floral diversity and floral choices by both individual bees and different bumblebee species.

The genetic data on the distribution of parasite strains shows that this asymmetrical transmission results in highly structured parasite populations, which is the pre-requisite for evolving species-specific strains and, ultimately, a new range of species-specific parasites. However, by looking at parasite populations in spring queens across



The neogregarine microparasite, *Apicystis bombi*, that is associated with rapid death in spring bumblebee queens.

Copyright M J F Brown

species, sites and years, we were able to show that this parasite population structure is constantly being destroyed and re-created in new forms (Ruiz-Gonzalez *et al.,* 2012). Again, this is probably a result of flowering phenology and changes in the bumblebee species assemblage within and across years. Ultimately, this dynamism in parasite population structure means that *C. bombi* must be generally adapted to a range of different host species. This means that the damage it does to any individual host species is unlikely to be fine-tuned to maximize parasite reproductive success, as would be the case in a species-specific parasite. Consequently, earlier studies that only examined parasite impact in one common host species (Brown *et al.,* 2003) need to be added to if we are to understand the impact of this trypanosome on individuals and populations of bumblebees.

We have tried to address this exact question using a second parasite, the nematode worm *S. bombi*. This is a fascinating parasite, and I refer you to an earlier article in *Bee World* if you want to learn more about its basic biology (Jones, 2011). While we are currently lacking molecular data for this parasite, we have been able to examine, in depth and detail, its impact on multiple host species and the presence of any host-species-specific impacts. Our data suggest that this is a classic, multi-host-species generalist parasite, castrating nearly all of its host bumblebee species, suggesting again that transmission across host species boundaries is common. Our ongoing studies are investigating the mechanisms behind how this tiny worm castrates its much larger host.

It is clear from the studies described above, and from recent work in other organisms (reviewed by Rigaud *et al.,* 2010) that the complexity of multiple host-parasite interactions can have real impacts on the abundance of parasites in an individual host population and the damage that those parasites do to any individual host. Our most recent project is investigating what this might mean for the impact and control of what were thought to be quintessential honey bee parasites, but are now believed to be present in other wild pollinators. How we manage the complex parasite communities of honey bee colonies may well have significant knock-on effects for wild bees as well.

References

Brown, M J F; Schmid-Hempel, R; Schmid-Hempel, P (2003) Strong context-dependent virulence in a host-parasite system: reconciling genetic evidence with theory. *Journal of Animal Ecology* 72: 994-1002.

Jones, C M (2011) Have you seen a bumblebee this year? *Bee World* 88(1):14-15.

Martin, S J; Highfield, A C; Brettell, L; Villalobos, E M; Budge, G E; Powell, M; Nikaido, S; Schroeder, D C (2012) Global honey bee viral landscape altered by a parasitic mite. *Science* 336: 1304-1306.

Rigaud, T; Perrot Minot, M-J; Brown, M J F (2010) Parasite and host assemblages: embracing the reality will improve our knowledge of parasite transmission and virulence. *Proceedings of the Royal Society B*, 277: 3693-3702.

Ruiz-González, M X; Brown, M J F (2006) Honey bee and bumble bee trypanosomatids: specificity and potential for transmission. *Ecological Entomology* 31: 616-622.

Ruiz-González, M X; Bryden, J; Moret, Y; Reber-Funk, C; Schmid-Hempel, P; Brown, M J F (2012) Dynamic transmission, host quality and population structure in a multi-host parasite of bumble bees. *Evolution* 66: 3053-3066.

Rutrecht, S T; Brown, M J F (2008) The life history impact and implications of multiple parasites for bumble bee queens. *International Journal of Parasitology* 38: 799-808.

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Are Pesticides the Most Important Cause of Colony Losses?

Norman Carreck

By the time you read this, the European Commission will have imposed a two year moratorium on the use, within its boundaries, of three neonicotinoid insecticides: imidacloprid, thiamethoxam and clothianidin, on bee friendly crops such as oilseed rape and sunflowers. This move, following an inconclusive vote on 29th April, has been hailed as a victory for bee conservation by environmental pressure groups: while being lambasted by the pesticides industry, who have come up with some very inventive estimates of the economic impact of the move. Governments around the world are watching. Beekeepers and bee scientists have found themselves in the middle of this often bad tempered debate which has been characterised by more heat than light. So what is the purpose of this ban, and what will be the effects on bees?

I have written about the story of pesticides and bees before (Carreck, 2008), and neonicotinoid insecticides are certainly not the only pesticides thought to affect bees. Concerns about neonicotinoids have not surfaced recently, but date back some twenty years, to the time when they were first extensively used on sunflowers in France. Since then, many multidisciplinary studies have been carried out there, but have failed to demonstrate an effect of these compounds on honey bee populations in the field (e.g. Chauzat *et al.*, 2009; 2010). If we have failed to demonstrate harmful effects in twenty years, will we be able to demonstrate some benefit of a moratorium in two years?

One difficulty will be that bee populations, like those of insects in general, fluctuate greatly from year to year, mainly due to weather conditions. For example, results of US surveys published recently in the *Journal of Apicultural Research* (Spleen *et al*., 2013) show that total honey bee colony losses over the 2011-12 winter at 22.5% were lower than losses in the previous five years for which comparable data were available. The authors attributed this to a relatively mild winter. In contrast, losses over the 2012-13 winter in both the USA and the UK seem to have been much more severe, again a reflection of weather conditions.

An analysis of the possible reasons for the colony losses reported by those US beekeepers (Spleen *et al*., 2013) shows that the most commonly reported factors for loss were weak colonies in the autumn, queen failure and starvation, all factors which ought to be avoidable (Carreck, 2012). Then comes the influence of the Varroa mite (Neumann & Carreck, 2010), whilst other factors such as pesticides, Colony Collapse Disorder symptoms and Nosema all come much lower down the list of factors suggested by the beekeepers.

The current debate has been prompted by a number of recent laboratory studies on both honey bees and bumble bees, which have shown subtle sub-lethal effects of neonicotinoids on bees. Some have been well designed studies (e.g. Gill *et al*., 2012; Whitehorn *et al*., 2012), but are open to various interpretations as to their implication in the field. Other studies that have been widely reported in the media have, however, actually been very poor. For example, the well-publicised study by Lu *et al*., (2012) was based on the assumption that High Fructose Corn Syrup (HFCS), widely used by US beekeepers, is contaminated by imidacloprid because this is used to treat corn (maize) crops. The authors fed honey bee colonies with high doses of imidacloprid in syrup, and they unsurprisingly died. This led the authors to conclude that they had “replicated” Colony Collapse Disorder, yet the symptoms experienced by the colonies were very different from those of CCD. Furthermore, a recently published study in the *Journal of Apicultural Research* by deGrandi-Hoffman *et al*. (2012) found no evidence that commercial HFCS is in fact contaminated with imidacloprid.

If growers of oilseed rape cannot use these three neonicotinoid seed treatments, they have various options available. They could stop growing the crop, but this is unlikely because it is currently very profitable and fits well into rotations with winter cereals. They could adopt Integrated Pest Management strategies, but adoption of these has historically been slow for a variety of reasons. They are unlikely to grow the oilseed rape organically, because of very low yields. They are most likely to return to using synthetic pyrethroid insecticides. In the UK these compounds have a very good safety record when we are considering actual losses of honey bee colonies (Carreck, 2008), but we did not previously consider sub-lethal effects. Just as we lack knowledge of the sub-lethal effects of neonicotinonids on bees in the field, we are similarly ignorant of the effects of synthetic pyrethroids.

I am not aware that a full Environmental Impact Assessment of the implications of a ban on neonicotinoids has been carried out, but surely this is essential. I sincerely hope that the two years of this moratorium will be used wisely by scientists to seek answers to the uncertainties in the neonicotinoid story, and that governments will make funds available to carry out the necessary research. If not, in two years’ time we will be having exactly the same debate…

References

Carreck, N L (2008) Pesticides and honey bees. *British Beekeepers Association News* 173: 3-4.

Carreck, N L (2012) Are bad beekeepers to blame for honey bee colony losses? *Bee World* 89(1): 10-11.

Chauzat, M-P; Carpentier, P; Martel, A-C; Bougeard, S; Cougoule, N; Porta, P; Lachaize, J; Madec, F; Aubert, M; Faucon, J-P (2009) Influence of pesticide residues on honey bee (Hymenoptera: Apidae) colony health in France. *Environmental Entomology.* 38(3): 514-523.

Chauzat, M-P, Martel, A-C, Zeganne, S; Drajnudel, P; Schurr, F; Clement, C-C; Ribiere-Chabet, M; Aubert, M, Faucon, J-P (2010) A case control study and a survey of mortalities of honey bee colonies (*Apis mellifera*) in France during the winter of 2005-6. *Journal of Apicultural Research* 49(1): 40-51. http://dx.doi.org/10.3896/IBRA.1.49.1.06

Gill, R J; Ramos-Rodriguez, O; Raine, N E (2012) Combined pesticide exposure severely affects individual and colony level traits in bees. *Nature* 491: 105-119. http://dx.doi.org/10.1038/nature11585

deGrandi-Hoffman, G; Sammataro, D; Simonds, R (2012) Are agrochemicals present in High Fructose Corn Syrup fed to honey bees (*Apis mellifera*). *Journal of Apicultural Research* 51(4): 371-372. http://dx.doi.org/10.3896/IBRA.1.51.4.16

Lu, C; Warchol, K M; Callahan, E A (2012) In situ replication of honey bee Colony Collapse Disorder. *Bulletin of Insectology* 65: 99-106.

Neumann, P; Carreck, N L (2010) Honey bee colony losses. *Journal of Apicultural Research* 49: 1-6. http://dx.doi.org/10.3896/IBRA.1.49.1.01

Spleen, A M; Lengerich, E J; Rennich, K; Caron, D; Rose, R; Pettis, J S; Henson, M; Wilkes, J T; Wilson, M; Stitzinger, J; Lee, K; Andree, M; Snyder, R; vanEngelsdorp, D (2013) A national survey of managed honey bee 2011-12 winter colony losses in the United States: results from the Bee Informed Partnership. *Journal of Apicultural Research* 52(2): 44-53. http://dx.doi.org/10.3896/IBRA.1.52.2.07

Whitehorn, P R; O'Connor, S; Wackers, F L; Goulson, D (2012) Neonicotinoid pesticide reduces bumble bee colony growth and queen production. *Science* 336: 351-352. http://dx.doi.org/10.1126/

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Conference Report

IBRA in Sweden

Lotta Fabricius Kristiansen

One of IBRA's Swedish members reports on a recently held conference where IBRA had a presence.

All About Bees is a national beekeeping conference that is arranged annually in Sweden. It is financed with support from the National Apiculture Programme. This year it was situated in Örebro, 200 km west of Stockholm. Around 160 beekeepers attended the conference. It started at lunchtime Friday the 12th April with *Dr Sara Leonhardt* from Leuphana University, Lüneburg in Germany as keynote speaker. She talked about *Plant resins – a neglected resource in the ecology of bees.* Then there were three parallel sessions:

Bumblebees and other wild bees, *Dr Björn Cederberg*

The interaction between honeybees, varroa and virus, *Dr Barbara Locke and Dr Joachim de Miranda* from the Swedish University of Agricultural Sciences

Beekeeping in Sweden and in the world Beekeeping in Somaliland Beekeeping in Russia

Integration project in Gothenburg – Andrés Amaya, "Bee partner" Beekeeping club in Sweden for beekeepers from Bosnia and Hercegovina

On Saturday there were two parallel sessions:

Pollination services, for beekeepers and farmers

Plant protection products and honeybees. Themes included:

Plant protection products in Sweden, *Jonas Östgren*, The Swedish Chemicals Agency

Neonicotinoids in the environment, *Dr Jenny Kreuger*, Centre for Chemical Pesticides at the Swedish University of Agricultural Sciences

The use of plant protection products in the agriculture systems, *Albin Gunnarsson* advisor in agriculture for the Swedish seed and rapeseed growers

The use of plant protection products in the forestry, *Mats Mellblom* advisor in forestry

Plant protection and honeybees, *Preben Kristiansen* advisor in bee health

Companies selling beekeeping equipment and others had exhibitions, including IBRA. Great days with a lot of new knowledge shared.

Keynote Speaker Sara Leonhardt of Leuphana University, Germany.

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Manuka Honey Explained

David Cramp

Confusion around manuka honey has existed ever since this remarkable product was proven to have medicinal qualities in the 1980s and, despite the attempts of the manuka honey industry in New Zealand, it still exists in large measure today.

The confusion around manuka honey prompted me to ask myself the question: how many consumers know the difference between the acronyms and numbers written for their benefit on manuka honey jars, or even what they mean?

I was a producer of active manuka honey. I knew exactly what it all meant. But others? The customer? What did they know of the terms and acronyms: Bio-Active; UMF®; TA; NPA; MGO™; MGS; AMF and Active. Just some examples that at least mean something. There are many that do not, yet all purport to say that this jar contains something special. Many jars do, some don't.

Once you have got past the acronyms, you have the numbers; UMF® 20+; MGO™ 20; NPA 10+; TA 25+ and so on. There is no other explanation on the jars that would indicate to consumers what they have just purchased, how it will help them or how it is different from a product with the same acronym and different number or a different acronym and the same number.

Manuka honey Bio Active UMF® 5+? Will that help my sore throat? Probably no better than any other honey; but how would you know that? You would need a pretty big label to explain it all anyway. The point is, how many would buy over the counter medicine without reading this sort of information in an explanatory leaflet? In this two part article I will attempt to clear away all of this confusion by firstly explaining just what manuka honey is and looking at what is so special about it. Part Two will look at the honey ratings and compare them so that when you buy a pot of manuka honey, you know exactly what you are buying.

Firstly, let's take a look at the antiseptic and anti-microbial properties that most honeys possess and then look at what makes manuka more special than others.

Peroxide activity (PA)

Most honeys have antibacterial activity, referred to as Peroxide Activity (PA), which is derived from Hydrogen Peroxide (H_2O_2). Peroxide Activity is created due to the activity of the enzyme Glucose Oxidase that is added to nectar by bees. It converts glucose into hydrogen peroxide and gluconic acid under aerobic conditions. The presumed function of H_2O_2 is to prevent spoilage of unripe honey when the concentration has not yet reached levels able to prevent microbial growth. During ripening, the glucose oxidase is inactivated but it is again activated on dilution, being at its highest level at a dilution of 30-50% honey.

Light and heat have an effect on this activity and it decreases over time with storage. Most honeys have this unstable peroxide activity, and the question is, does honey have any antimicrobial activity if you take away the hydrogen peroxide? The answer is yes – for many honeys, and this 'extra' antibacterial activity is especially strong in manuka honey. So what is this 'extra quality' of manuka honey and how can any difference be investigated?

Non Peroxide Activity (NPA)

Manuka honey has a strong, stable activity shown to be effective even after the elimination of peroxide activity in the honey and this Non Peroxide Activity (NPA) can be measured. All honeys have this NPA to varying degrees because there are other compounds and peptides in honey that provide a measure of NPA but it is only New Zealand's Manuka that has been given such an unmatched amount of attention in terms of empirical studies, research, accreditation and certification.

For many years it was not clear just what was providing this 'extra' activity but the effect could be quantified fairly early on by comparing its bacteria killing effect with that of the antiseptic phenol. Because the causative agent was unknown, the effect was nicknamed the 'Unique Manuka Factor' or 'UMF' by Dr. Peter Molan of Waikato University in New Zealand who lead early research into this phenomenon. Now, under the auspices of the UMF® Honey Association, the term has now become a trademark and companies wishing to use this trademark for their honey must adhere to the strict quality controls and testing regime of the association.

When Professor Molan tested the manuka honeys he used the internationally recognised method of measuring the surface area kill-zone of a sample of honey dropped onto a plate of bacteria. This type of assay is known in bacteriology as the 'agar well diffusion assay', and uses *Staphylococcus aureus* as indicator bacteria and the antiseptic phenol as standard. (Allen *et al.*, 1991). In layman's terms, the ability of the honey to kill bacteria is compared to a known-strength chemical (phenol). For example, a UMF®10+ active Manuka will have a bacteria-killing activity equivalent to a

Fig. 1. Agar well diffusion assay.

10% solution of phenol. UMF®12+ active Manuka is equivalent to 12% solution of phenol and so on. This UMF® measure tells you what the effect of the honey is and is a recognised measure of the honey's NPA.

The size of the kill-zone (Fig. 1.) is compared to that which phenolic acid would achieve. The test shows that the honey has the germ killing effect of the phenol, not necessarily the actual effect on a person. For example, an industrial strength solution of phenolic acid is 4% (UMF® 4+) and that will kill bacteria but also harm skin tissue. The UMF honey equivalent would not. Manuka honey with a 20% (UMF®20+) potency has been used to treat eye infection but if 20% phenolic acid solution had been used it would have caused blindness.

The bioassay method used by Professor Molan was a simple laboratory test used against just one bacterium and was not initially intended for a complex task such as measuring differences between honeys. The method has been adapted and refined over the years and still remains the benchmark, but it can produce an unpredictable reading which critics claim offers misleading and variable advice to the purchaser of honey. Also, the assay only measures the level of antibacterial activity and is not informative regarding the identity of the components involved.

Another criticism, which also applies to the MGO™ measure (see below), is that it doesn't tell you what a given measurement will do for you. I know many who swear by UMF® 5+ manuka honey for sore throats. It has an insignificant to zero level of activity; but it is 'manuka' with a plus number and a plus sign, so it must be good – the placebo effect or would any other much cheaper honey have done as well with its normal peroxide activity?

In 2008, Professor Thomas Henle, Head of the Institute of Food Chemistry at the Technical University of Dresden, demonstrated that methylglyoxal (MGO) is the dominant ingredient that endows manuka honey with its unique antibacterial properties. (Henle, 2008).

Manuka Health, a New Zealand based company teamed up with Professor Henle to help further investigate this active ingredient in manuka honey and to set up a process in which manuka honey could be tested for levels of methylglyoxal. The company claims, with some authority, that this measurement offers the consumer complete transparency. MGO™ 400+ indicates that there are 400 milligrams per kilogramme of methylglyoxal in the honey. What could be clearer? At the moment, Manuka Health Ltd is the only New Zealand Company that offers certified MGO™ manuka honey and MGO™ has become a trademark.

The MGO™ measures the amount of one of the causative agents of NPA, and UMF® measures the effect of that agent on a specific bacterium and there is a correlation between the level of methylglyoxal and the honey's NPA or UMF®.

Critics of the MGO™ measurement claim that the measurement of the amount of methylglyoxal in honey gives no indication of the amount of anti-bacterial activity which is also influenced by other 'synergistic' compounds within honey without which methylglyoxal is not effective. For instance, activity against vancomycin-resistant *Enterococcus faecium* required different combinations of compounds, as neutralization of either H_2O_2 (hydrogen peroxide) or a combination of methylglyoxal and bee defensin-1 abolished activity. So, H_2O_2 is required but is not sufficient for activity against *E. faecium*, since the presence of methylglyoxal or bee defensin-1* is additionally required for full activity. (*Kwakman and Zaat, 2012)*.

Backing this up, another study has shown that the antimicrobial activity of methylglyoxal is enhanced when in honey solution, even if a honey has no antimicrobial action on its own. The reasons for this enhanced activity are unclear. In the clinical setting, therefore, a combined methylglyoxal and honey solution (whether from manuka or fortified non-methylglyoxal honey) yields a stronger antimicrobial activity compared to an equivalent. Methyl-glyoxal is therefore only partially responsible for the antibiotic activity of manuka honey. (Jervis-Bardy *et al*., 2011). Further proof exists in other studies and so it appears that methylglyoxal is not fully responsible for manuka non-peroxide antimicrobial activity.

It is evident that as honey is a purely natural product its mechanisms of bactericidal activity are highly complex and vary for individual bacterial species. Such complex interactions preclude prediction of the relative contribution of individual components to the overall antibacterial activity of honey and so merely giving an indication of the amount, in milligrams, of methylglyoxal, or any other antimicrobial agent, in a honey isn't really giving you the full story – but then, neither does the UMF® measure. Both of the rating systems have their advantages and disadvantages and neither is perfect.

As well as research into measuring the "strength" of the manuka honey, there is also an increasing body of research into the detection of adulteration of manuka honey. For example, the NPA rating of a batch of honey can be raised by adding extra methylglyoxal. With a higher methylglyoxal reading, a higher price can be achieved even though the honey may not actually have any extra NPA. The UMF® Honey Association has spent hundreds of thousands of dollars in research on the detection of adulteration, for example, the detection of synthetic DHA (Dihydroxyacetone) (understood to be a precursor for methylglyoxal with the potential to more accurately predict the future methylglyoxal content level in fresh

Footnote. *Bee defensin-1 is a small antimicrobial peptide and is part of the honey bee immune system. It also contributes to the antibacterial activity of honey. It is synthesized in the bee's salivary glands.

honey), and the detection of added methylglyoxal itself and will be rolling out this test method into its international network of labs in the near future.

So UMF® and MGO™ are both measures of NPA (Non-Peroxide Activity) and we have now seen exactly what they are measuring and why. In Part Two of the article, we look at how the two ratings correlate and we investigate all of the other ratings and numbers that you can find on jars of manuka honey. I also provide a buyers checklist so as to banish any confusion that may still may exist.

Acknowledgements

In preparing this article I would like to acknowledge the kind assistance of Mr John Rawcliffe, CEO of the UMF® Honey Association and Mr Kerry Paul, CEO of Manuka Health New Zealand Ltd and marketers of MGO™ rated honey.

References

Allen, K L; Molan, P C; Reid, G M (1991) A survey of the antibacterial activity of some New Zealand honeys. *J Pharm Pharmacol* 43(12): 817-22.

Henle, T (2008) Identification and quantification of methylglyoxal as the dominant antibacterial constituent of Manuka (*Leptospermum scoparium*) honeys from New Zealand. *Molecular Nutrition and Food Research* 52(4): 483-489.

Jervis-Bardy, J; Foreman, A; Bray, S; Tan,L; Wormald, P-J (2011) Methylglyoxal-Infused Honey Mimics the Anti-Staphylococcus aureus Biofilm Activity of Manuka Honey: Potential Implication in Chronic Rhinosinusitis. *Laryngoscope* 121(5): 1104-1107. http://dx.doi.org/10.1002/lary.21717

Kwakman, P; Zaat, S (2012) Anti-bacterial components of honey. *IUBMB Life* 64: 48–55. http://dx.doi.org/10.1002/iub.578

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Apicultural Requests in Early Welsh Poems

William Linnard

Cywyddau gofyn (request poems) form a significant genre in medieval and early modern Welsh literature and a few of these poems contain some apicultural material. Hitherto quite unknown to beekeepers and of considerable historical interest, three of these early Welsh poems are discussed here and drawn to the attention of a wider readership unable to read the originals.

Introduction

Much important information on bees and beekeeping in Wales has been published in several major books and articles in English (Crane, 1983; Crane and Walker, 1984, 1985; Walker and Linnard, 1990) and also in three books in Welsh (Jones and Jones, 1888; Jones, 1960; Williams, 1972). Taken together, all these various Welsh and English publications contain a great deal of interesting and valuable information on the history of beekeeping in Wales, information derived from archaeology, diverse documentary sources, Welsh literature, and tradition.

However, one important literary genre has been overlooked hitherto as a source of information on the history of beekeeping in Wales, and the present note seeks to draw attention to this, namely the class of poems known as *cywyddau gofyn* (request poems) and *cywyddau diolch* (thanking poems). These were poems written by Welsh bards requesting a gift from a wealthy patron, or thanking him for the gift. The gift was requested either directly for the poet himself, or by the poet acting as an intermediary on behalf of someone else. A few similar poems are known in Irish, Scottish and Scandinavian literature, but their numbers are very small compared to the large body of poems in Welsh.

Of the countless poems of this genre composed in Welsh in the period from the fourteenth to the seventeenth century, many have survived, and a full (though not exhaustive) list of 650 of these poems, by some 150 different poets, has been published by Huws (1998). His analysis shows that the three main categories of gifts requested were animals (especially horses and hounds of various kinds); arms and weapons; clothing and apparel. However, various individual gifts requested include numerous other objects of the most diverse kinds, ranging from swans to spectacles, from jewellery to millstones, from books to beehives, and from a coracle to a chastity belt.

In Wales the poems of this genre were written as rhyming couplets, in *cynghanedd* (sound-chiming within each line, with serial repetition of consonants in precise relationship to the main accents, together with the use of internal rhymes), with the accent falling alternately on the last and the penultimate syllable (Stephens, 1986). These poems usually had a fairly standard structure:

(1) introductory address praising the potential donor
(2) presentation of the petitioner and mentioning the gift requested
(3) description of the gift by *dyfalu*
(4) a brief conclusion.

Dyfalu is a particular traditional feature of Welsh request poems, and means the use of very fanciful language and figurative similes, metaphors and epithets to describe the object requested without actually naming it. To give just one example of this, a poet, Huw ap Dafydd (*fl*. 1520-1540), in requesting a bow, actually described its sound, i.e. the twanging of the bow-spring, as being like the noise of a clock:
Mal cloc bêr ei lleferydd/Yn nodi awr yn y dydd [Like a sweet-voiced clock/ Noting the hour in the day]

With their intricate verbal and stylistic expression, the request poems are sometimes close to riddles, and often present problems for the translator. However, of the hundreds of surviving request poems, only three are known that specifically request bees or bee-hives, and it is with these that we are concerned.

The first of these poems is by the poet Roger Cyffin, *fl*. 1587-1609, originally from Denbighshire but who apparently spent the second half of his life in South Wales. He composed a poem asking for bees on behalf of Huw ap Rheinallt and Gwenhwyfar, his wife, of Celynog near Llanrhaeadr-ym-Mochnant, on the border of Montgomeryshire and Denbighshire. The young couple had just got married and were setting up home together, and the poet described them as follows:

Wrth ddechrau, llyna ddau ddyn/ Chwannog i gwch o wenyn [Here are two people starting/Desirous of a hive of bees].

Obviously a hive of bees would have been a valuable and important item for a young couple just starting married life together in a poor rural community.

The usual Welsh word for a skep or hive is *cwch* (literally 'boat' or 'vessel'), plural: *cychod*. These Welsh hives were traditionally made of lipwork, using coiled straw or sedge skilfully stitched together to form the basket-shaped skep. These skeps were made either by specialist craftsmen, or by handy men working part-time to supplement their income. Owen Thomas, an agricultural labourer, beekeeper and part-time skepmaker, who lived in Denbighshire and who died in 1776, was one of these latter (Linnarfd and Crane, 1989). His diary shows that during a period of thirty years in the middle of the century he made no fewer than 2,920 skeps, an average of 97 per annum. There was evidently a large local demand for his skeps. In Wales as in England, some beekeepers kept their straw skeps in bee boles or other stone structures providing shelter from the wind and rain.

The other two poems of apicultural interest are both by Morus Dwyfech, *fl*. 1523-1590. He was a poet of Caernarfonshire, who took his name from the river Dwyfech (the modern form of the river's name is Dwyfach), which flows down from the western slopes of Snowdonia to enter the sea near Llanystumdwy. Morus composed a poem addressed to twelve local men of the Llŷn peninsula, requesting a dozen bee-hives on behalf of Lowri, the daughter of Huw ap Siôn of Aberdaron, a seaside village at the very end of the peninsula. The hope was that these twelve men would each give one hive to poor Lowri, and so provide her with a good source of income. Unfortunately, nine of the men refused to give a hive, and only three were generous enough to donate. Morus thereupon composed another satirical poem, 92 lines long, castigating the nine mean-spirited men who did not donate hives. He named each of these nine, giving their family antecedents and describing them scornfully in scathing terms such as: 'old fox', 'churlish boar', 'greedy lout', 'fat-bum', 'sullen sot', 'mean miser', 'cold wretch', 'unloved', 'clumsy knave', 'miserly', 'sour churl', 'crabbed old rascal' and so on. Finally, he named the three good fellows who had each donated a hive, namely Gruffudd, Rhobert and another Gruffudd, praising all three of them as shining examples, good-hearted and generous men.

Together these three poems give us a brief but fascinating glimpse of the human side of beekeeping in Welsh rural communities in the sixteenth century.

References

Crane, E (1983) *The Archaeology of Bee-keeping.* Duckworth, London.

Crane, E; Walker, P (1984-5) Evidence on Welsh beekeeping in the past. *Folk Life* 23: 21-48 also 24: 121-123.

Huws, B O (1998) *Y Canu Gofyn a Diolch c. 1350-c.1630.* (Request and thanking poems c. 1350-1630), UWP, Cardiff.

Jones, M D; Jones, H P (1888) *Y Gwenynnydd* (The Beekeeper), Bala.

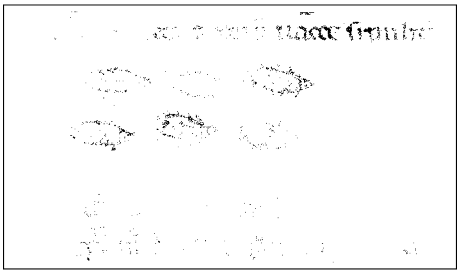
Jones, J E (1960) *Rhamant y Gwenyn* (Romance of the Bee).

Linnard, W; Crane, E (1989) Owen Thomas, a Denbighshire bee-keeper and skepmaker in the eighteenth century. *Denbighshire Historical Society Transactions* 5-17.

Stephens, M (1986) *Oxford Companion to the Literature of Wales*. OUP, pp. 114.

Walker, P; Linnard, W (1990) Bee boles and other beekeeping structures in Wales. *Archaeologia Cambrensis* CXXXIX 56-72.

Williams, M R (1972) *Y Fêl Ynys* (The Isle of Honey).



Representation of bees in Peniarth MS 28 (13th Century), National Library of Wales. Reproduced from *Evidence on Welsh Bee-keeping in the Past,* by Crane and Walker. (Editor: this book is available from the IBRA Bookshop for £2.00 plus p&p).

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Migratory Beekeeping in Jammu and Kashmir, India

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Bee-keeping is a potent low investment enterprise in J&K. With its great variety of agricultural and climatic conditions and an exceptionally long season during which pollen and nectar secreting flora is available in one area or another, migration has assumed really important dimensions in commercial beekeeping. The migratory system of bee-keeping is more economical than stationary bee-keeping system as it not only helps in boosting income of the individual bee-keeper but also helps in increasing productivity of cross-pollinated crops and generates employment. The commercial bee-keepers practising migratory bee-keeping use Langstroth hives and have 4-5 harvests per year with an average annual yield of approximately 50-60kg per hive. Small scale farmers generally do not move their hives and harvest 1-2 times per year (10-20kg per hive). Lack of public and private support; weak research and development; insufficient support for small beekeepers are the main constraints in promoting migratory beekeeping in the state.

Introduction

The state of Jammu and Kashmir (32°17′ to 37°05′N and 72°40′ to 80°30′E) represents one of the most important beekeeping areas in India. At least four agroclimatic zones ranging through low altitude subtropical, intermediate, temperate and cold alpine occur. Temperatures range from -45°C to +45°C. Such diversity of geographical features plays a dominant role in determining the topography, climate and plant species present in the region. It offers great potential for both migratory and non-migratory beekeeping. Local communities in the state have always harvested honey from the wild and many still do so.

The State of Jammu and Kashmir is richly endowed with diverse forest resources which play an important role in preserving the fragile ecosystem of the region. The forest area of the state is 20,230 sq km which is about 10% of its geographical area. If the Ladakh region is excluded, which does not have significant expanse of natural forests, the proportion of natural forests in the state area increases to 47%. About 40% of the forest area is either dense or very dense and the rest falls in the category of open forest. The 60% of the total forest area falls in Jammu region and the rest in Kashmir. A good percentage of forest cover and negligible use of pesticides in cropped land offers the state vast potential scope for producing organic honey and pollen for the world market.

Table 1. Status of beekeeping in Jammu & Kashmir state.

	Particulars	Number
1	No. of beekeepers	1,865
2	No. of colonies (*Apis mellifera*)	29,932
3	Log & Wall colonies (*A. indica*)	10,561
4	Total bee colonies	40,493
5	Total honey production (q)	1187.62

Beekeeping in Kashmir dates back to 1470 AD. The history of rearing indigenous hive honeybee *Apis cerana* Fab. can be traced to the beginning of the 19th Century, when the people started keeping them in log hives or clay pot hives kept in the mud walls of the houses. The first modern apiary using *A cerana* was established in Kashmir as early as 1930 at Srinagar and modern beekeeping gradually developed thereafter. By 1960, there were 25,000 colonies in modern hives and between 10,000 to 15,000 wall/log hives producing 48,000 kg of honey valued at more than 10 million rupees (about $ US 23,000). The average honey yield per colony ranged between 10-12 kg, compared with 4-6 kg produced elsewhere in the country. This was mainly due to the superior strain of the bee present, the rich bee flora, good management techniques and favourable climate (Shah and Shah, 1982). The state has a large and as yet, not realized, beekeeping growth potential that exceeds the actual production level by at least four times.

In J&K, there are about 1867 beekeepers having 29,932 *A. mellifera* and 10,561 *A. cerana* colonies (wall/log and modern hives) with more 1900 beekeepers producing over 2,000 metric tones of honey worth 1.25 million Indian rupees (approximately USD$23,000) every year (Table 1). Approximately 30 per cent of the honey producing colonies in the state are native *A. cerana* and the rest are *A.mellifera.* The migratory system of beekeeping has been used since 1952 and beekeepers in the state still continue the practice. The *A. mellifera* colonies

Table 2. Migratory sites and major bee flora in areas of the state for optimal utilization of floral resources.

Migration site	Period	Major bee flora
Higher hills (whole of Kashmir and higher reaches of Doda, Ramban, Banihal, Kishtwar Poonch and Rajouri districts)	February - April	*Brassica sp., Trifolium sp., Robinia pseudoacacia, Prunus, Rosa, Acacia, Rubus*
	May - June	*Acacia, Brassica, Raphanus, Fagopyrum, Acacia sp.*
	July - August	*Zea, Trifolium, Indigofera, Helianthus, Plectranthus*
	September - October	*Zea, Trifolium, Helianthus, Crocus, Plectranthus*
	November - December	*Crocus*
Lower hills (parts of Doda, Ramban, Banihal, Kishtwar Udhampur, Poonch and Rajouri districts)	January - February	*Salvia, Salix, Viburnum, Rosa*
	October - March	*Isodon rugosus*, *Brassica campestris*, *Wendlandia*, Toon
	October - December	*Brassica campestris* var. *toria*, *Eucalyptus*
	November - May	Litchi, berseem, sunflower
	April - June	*Litchi*, *Citrus*, *Prunus*, *Acacia*, cucurbits, *Adhatoda vasica*, *Pyrus, Rosa, Rubus sp.*
	July - August	*Trifolium, Medicago, Plectranthus, Dianthus*
	August - October	*Zizyphus*, Maize, *Brassica*, *Trifolium*, *Olea sp.*
	February - March	*Brassica* sp., *Eucalyptus*, shisham, drumstick
	December - March	*Brassica* sp., *Eucalyptus*, coriander, Fennel,
	March - May	Jamun, *Indigofera, Allium*
Plains (Jammu, Samba parts of Kathua and Udhampur)	January - March	*Brassica, Mangifera, Wendlandia*
	March - April	*Brassica, Cassia, Citrus, Dalbergia, Mangifera,*
	May - June	*Dalbergia, Zizyphus, Cassia, Acacia, Grewia*
	July - August	*Acacia, Zizyphus, Grewia*
	September - October	*Sesamum, Zea, Acacia, Zizyphus*
	November - December	*Brassica, Bauhinia*

are generally used in migratory bee keeping and several thousand hives are transported yearly. The *A. cerana* colonies are usually not used in migratory bee-keeping and mostly kept in wooden logs or modern bee hives. The Doda, Ramban, Banihal, Kishtwar and Udhampur Districts of Jammu region and Anantnag district of Kashmir have the most potential bee-keeping. Kathua, Jammu, Rajouri, Poonch, Pulwama, Baramulla, Srinagar and Kupwara districts have the potential for less dense beekeeping, while Ladakh and Leh areas are not suitable for bee-keeping.

The surplus honey is collected from *Plectranthus* during June - October in the districts of Banihal, Doda and Ramban. In other parts of the state, honey flow is taken from mixed flora like *Brassica* spp., *Eucalyptus* spp., *Citrus* spp., *Litchi* spp., *Toona* spp., *Dalbergia* spp., *Trifolium* sp., *Syzgium* sp., *Acacia* sp., *Sapindus* sp., etc., during spring and summer seasons. In some pockets of Kathua, Samba and Jammu, honey is collected from *Acacia catechu* (Khair) during June - July. Generally migratory beekeeping takes place from October - November to May - June by migrating the bee colonies from the hills to the plains of Haryana, Punjab and Rajasthan. The colonies of the state department are brought to the hills at the end of March for apple pollination. In the plains honey is collected from Toria, Sarson, Eucalyptus, Shisham, Berseem and Sun flower. Private beekeepers are getting 35-60 kg honey by multi locational shifting of colonies and 5-10 kg/colonies/ year in stationery beekeeping. From *Plectranthus* flow, they are getting 20-25 kg honey/colony/year. These beekeepers are getting more than 40-50 per cent profit on the investment they have made in the beekeeping.

Though beekeepers are undertaking migration for production, there is even greater scope to increase the efficiency and improve honey production. This can be facilitated with knowledge of the floral resources and evolving appropriate migration schedules for different bee-keeping regions. A detailed study of the floral resources for *A. mellifera* in J&K and seasons for honey production in different regions has been presented (Table 2). The flora required for bee-keeping is available throughout the year and provides sufficient bee forage for the production of honey and other products of commercial value. All this makes it a best fit for both migratory and stationery beekeeping.

Migration Pattern of Beekeepers

Interstate Migration

The beekeepers migrate colonies from Jammu to farms of *Sorghum, Eucalyptus, Brassica* and *Cajanus cajan* crops (10-15 kg honey/colony) in the plains of Uttar Pradesh (Aligarh) from the end of October to the end of December (Table 3). The colonies are then moved during November/December until mid February to Alwar and Kota areas of Rajasthan for the flow from sarson (20-25 kg honey/ colony). Colony development and breeding is done during mustard blooming. Half of the mustard flow and other blooms are utilized for honey extraction. Beekeepers report an average 1:1 colony multiplication during these migrations. Around 250 to 300 hives are migrated on a single truck and cover a distance of

Table 3. Migration pattern of beekeepers of the state.

Area of migration	Period
Outside the state	
Banihal, Ramban	June - Ending October
Jammu	Ending October - November
Aligarh	Ending October - End of December
Rajasthan (Alwar, Kota, Ganga Nagar)	Ending November / December - Mid February
Rajasthan (Ganga Nagar)	Ending November - Mid March
U.P. (Saharanpur)	Mid February - Mid March
Bara (Kota; Rajasthan)	Mid February - Mid March
Jammu (Purmandal, Bishnah, Miran Sahib, R. S. Pura, Ghou Manhasan)	Mid March - Ending May
Jammu (higher reaches of Reasi, Samba, Udhampur, Rajouri)	June - July
Srinagar, Anantnag	March - July
Within the state	
Jammu (R. S. Pura, Bishnah, Purmandal), Samba (Mansar, Raya Morh, Dhiansar), Kathua (Chadwal, Billawar, Dayalachak) and Udhampur (Chenani)	December - March
Upper reaches of Jammu, Samba, Kathua, Rajouri, Poonch and Udhampur	April - June
Doda, Banihal and Ramban districts	June - August
Upper reaches of Sunderbani (Rajouri) and Nowshera (Poonch) areas	April - July
Srinagar, Anantnag, Quazigund, Pulwama, Pampore	May - June

300 to 800 km. The colonies are migrated during February to March in areas of Bara (Kota) in Rajasthan for *Coriander* flow (10-15kg honey/colony), or Saharanpur in western Uttar Pradesh for the mustard and *Eucalyptus* flow (5-10 kg honey/colony). The colonies are taken to the plains of Uttar Pradesh are then brought back during March-April to locations around Jammu to utilize the flow from the multiflora (5-10 kg honey/colony). After the multiflora season, colonies from the Jammu area are migrated to Srinagar (Pampore) for forage from saffron (8-10 kg honey/colony) in April-July. The colonies from Jammu can be migrated to locations around or near Srinagar for *Robinia pseudoacacia* during March-April. This species is a dependable source of nectar and colonies can produce surplus honey. Some beekeepers migrate their colonies to local areas of Jammu for the flow from berseem (5-6 kg honey/colony) in April - May and from *Acacia*/*Toona* in June- July. Colonies in some cases are further shifted to Banihal and Ramban areas during June to October to utilize the flows from the *Plectranthus* or to upper elevations for flow from buck-wheat during June to September. The colonies are brought back to Jammu during ending October to November to utilize the flow from toria and ber (10-15 kg/colony). Some beekeepers practise only one migration. They migrate their colonies to Ganga Nagar (Rajasthan) for mustard (20 kg honey/colony) from the end of November to mid March and bring back their colonies during March to locations around Jammu to utilize the flows from jamun, neem, eucalyptus, berseem, mustard, shisham (15-20 kg honey/colony). The beekeepers are able to harvest 50-60 kg honey/colony/year which is about five times more than obtained with stationery beekeeping. In addition, beekeepers could increase their colonies by at least 20 per cent and save the maintenance cost during dearth period. The strength of the colonies also improves by migration more conveniently than by artificial feeding and the duration of the dearth period is also minimized.

Within state migration

Several vegetation regions within the state exhibit short/long gap of flowering. Migratory beekeeping can be practised to overcome these deficiencies in bee forage availability. The migration between hills and plains is a routine procedure adopted by commercial bee-keepers of the state. Inter migration between the plains, lower and upper hills help cut down these losses (Table 3).

Beekeepers under stationary beekeeping kept an average of 22.85 bee colonies, incurring a cost of about Rs. 442.50 (about US$8.00) per colony, while those practising migratory beekeeping within the state and outside the state kept 39.00 and 165.75 bee colonies respectively and spent about Rs. 787.50 (US$14.60) and Rs. 1300 (US$24.00)per colony, respectively. Honey production was an average of 9.35 kg/colony in the stationary beekeeping while it was 34.50 and 17.50 kg/colony in the outside and within state migratory systems respectively. The net returns were Rs.445.75 (US$8.00) Rs.875.00 (US$16.00)and Rs.1812.50 (US$33.50) in the stationary beekeeping, within state and outside state migration, respectively. This shows that differences in cost structure are marginal between the three types of beekeeping but due to higher honey yield net returns are almost three times higher in case of migratory bee keeping. In Himachal Pradesh, the beekeepers harvest 15.66 and 41.60 kg of honey/colony/year from stationary and migratory beekeeping, respectively (Sharma and Bhatia, 2001). While in Bihar, the honey yield is highest with a production rate of 40 and 60kg/hive/year under stationary and migratory *A. mellifera* colonies, respectively (Bansil, 2011). Deodikar and Thakar (1966) discussed the aspect of migration of bee colonies from forests in the hills to farms and orchards in the adjacent plains in order to utilize the local bee flora and improve bee forage availability to bee colonies. Chaturvedi *et al*. (1969) stated that migratory beekeeping in the Kumaon region of Uttrakhand could enhance honey production and colony multiplication. Ahmad *et al.* (1984) developed schedules for migration of bee colonies of profitable honey

Colonies migrated to the high Kashmir valleys during the summer.

Winter migration to the plains.

production (16.08 kg/colony) compared with non migrated colonies (2.8 kg/colony) with 60 per cent mortality of the colonies during dearth season. Sihag (1990) suggested migration as an important beekeeping practice for *A. mellifera* in Haryana. Singh *et al*. (1998) suggested certain migratory routes for honey production and colony multiplication in Bihar, India. Gatoria *et al*. (2001) gave a brief account of examples of some routes followed by beekeepers practising migratory beekeeping in different parts of the country.

Conclusions

There is a great scope for growth and development of migratory beekeeping in Jammu and Kashmir state. The success of beekeeping depends upon some basic factors such as suitable climatic conditions, bee forage, bee management and bee breeding. Migratory beekeeping increases the honey production manifold as compared to the stationary beekeeping. The diversified flora like *Prunus*, *Trifolium*, and *Plectranthus* have a high reputation in the market and can be sold by their floral brand name. Customers' demands can be fulfilled and can fetch a good market price for these floral honeys.

Acknowledgements

The authors are thankful to beekeepers of the state for the information of inputs required for the manuscript.

References

Ahmad, R; Camphor, E; Ahmad, M (1984) Migration of the Eastern bee (*Apis cerana*) colonies and its effect on honey yield. *Pakistan Journal of Agriculture Research* 5(1): 65-68.

Bansil, P C (2011) *Bihar Agriculture: A Perspective.* Concept Publishing Company Pvt. Ltd., New Delhi. pp 553.

Chaturvedi, P L; Hussain, S R ; Nath, S (1969) A tip for migratory bee-keepers of Kumaon region. *Indian Bee Journal* 31: 48-51.

Deodikar, G B; Thakar, C V (1966) Utilization and improvement of the local floras as bee pasturage. *Indian Bee Journal* 28: 11-15.

Gatoria, G S; Chhuneja, P K; Aulakh, R K; Singh, J (2001) Migratory bee-keeping in India: its prospects and problems. *Indian Bee Journal* 63(1-2): 23-34.

Sharma, R; Bhatia, R (2001) Economics of stationary and migratory beekeeping in Himachal Pradesh. *Agriculture Science Digest* 21(3): 196-197.

Sihag, R C (1990) Seasonal management of honey bee (*Apis mellifera* L.) colonies in Haryana (India). *Indian Bee Journal* 52(1-4): 51-56.

Singh, T S M S; Subba Rao, K; Mohana Rao, G (1998) Migratory routes for honey production and colony multiplication in Bihar, India. *Indian Bee Journal* 60(4): 207-209.

Summer migration to the high hills.

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New on the Library Shelf

A sting in the tale

by:
Dave Goulson

Published by Jonathan Cape, London, UK.
256 pp, hardback. ISBN: 9780224096898
Available from IBRA at £14.00 plus p&p. (RRP £16.99)

Dave Goulson will be familiar to many IBRA members as a UK based bee scientist, first at Oxford and Southampton Universities, then as Professor at the University of Stirling, and now recently relocated to the University of Sussex. Dave will also be well known as the founder of the Bumble Bee Conservation Trust, a UK based charity.

This is a very different book from his earlier academic tome *Bumble bees: behaviour, ecology, and conservation* published in 2003 and updated in 2009. The latter was full of references and diagrams, so that it has rightly become a standard text book. In contrast, *A sting in the tale* has no references, and no illustrations at all. It is a very personal account of the author's interest in natural history and how he came to focus on bumble bees. It gives several examples of the principles and practice of bumble bee conservation.

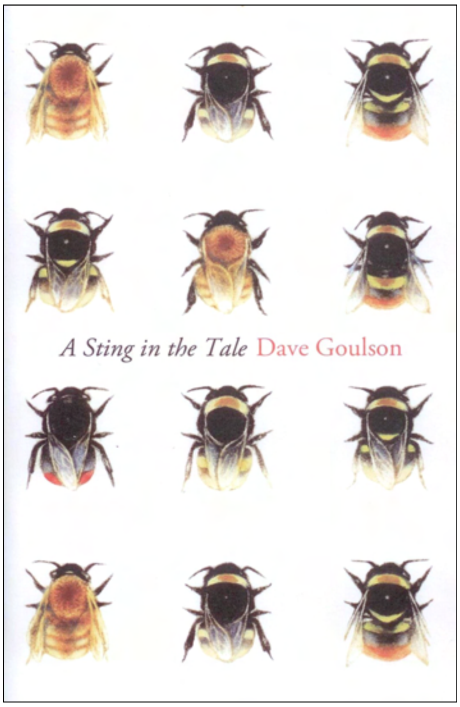
The prologue describes Dave's childhood attempts to emulate his hero Gerald Durrell, not in the Corfu of the 1930s, but the somewhat less exotic Shropshire of the 1970s. He describes a number of rather disastrous attempts to domesticate a range of unfortunate creatures, but also the beginnings of the serious study of nature, and the collection and preservation of specimens. During this period, however, he began to realise that the landscape changes that he was observing in the local farmland could be having an adverse effect on wildlife.

He then goes on to give an account of the life history of bumble bees and their biology. This is followed by chapters posing questions of why some bumble bee species have become rare or extinct whilst others still flourish, attempts to objectively monitor bumble bee populations through, for example, the use of sniffer dogs to find nests and the phenomenon of cuckoo bumble bees. He looks at the problems inherent in commercially rearing bumble bees and then shipping them around the world for crop pollination. As well as describing the practicalities of his own research he reviews the current state of our understanding.

Perhaps the most important of the chapters are those describing the realisation that it was possible to try to reverse declines of bee species, resulting in the Bumble Bee Conservation Trust. This is not a mere campaigning organisation, but from the outset has promoted the conservation of bumble bees through education and information. It also works in practical ways by the establishment of nature reserves and other measures. The final chapter describes the innovative continuing project to reintroduce the extinct *Bombus subterraneus* to the UK from surviving populations in Sweden and New Zealand, and emphasises the biological, practical and bureaucratic difficulties of such a programme.

This is a very enjoyable and inexpensive book, which can be easily read from cover to cover, but nonetheless contains much good science. It should further raise the profile of bee conservation, and makes an excellent gift.

My only irritation is Dave's use of pseudo English names for the bumble bee species. Many of our wild flowers have a



fascinating and confusing range of extremely ancient and local common names, which are rightly still preserved, although most gardeners, from whatever background, manage to use difficult to pronounce scientific names without any obvious problem. In contrast, bumble bees do not have ancient common names, so in the 1930s when Edward Step wrote his guide to bees in the famous "Wayside and Woodland" series, he found it necessary to invent some, in order to be uniform with earlier volumes covering plants, birds, mammals etc. Many of these invented names are extremely banal, but more importantly are unhelpful, since, for example, we find many species of bumble bee in the garden, not just the "garden" bumble bee *Bombus hortorum*.

Norman Carreck NDB

Present Day Beekeeping in the Ukraine

Richard Jones

From 29th September to 4th October Kyiv will be the focus of attention for bee scientists and beekeepers from all over the world as they assemble for the XLIII Apimondia Congress. This article takes a look at the current beekeeping scene in this large and honey productive country.

Migratory beekeeping is an important part of Ukrainian apiculture. This shows a mobile commercial apiary on a very long trailer.

Ukraine is probably one of the biggest honey-producing countries in Europe a fact that does not seem to be appreciated internationally. The beekeeping industry of Ukraine has become very highly developed. Demand for Ukrainian honey is growing on both the internal domestic and the export markets. There is at present an annual 10-15% increase in Ukrainian consumption of honey.

The Ukraine has over 400 thousand beekeepers in a population of about 46 million. In terms of population it ranks fifth when placed alongside the countries of the EU (Germany, Italy, UK and France are bigger) but the number of beekeepers as a percentage of that population (0.87%) puts it clearly ahead of any other nation (Romania, the Czech Republic and Slovenia are the highest in the EU with a proportion of about 0.5%).

A large part of the beekeeping fraternity are farmers, private land owners who operate private beekeeping enterprises. A large number of people, other than beekeepers, are employed in the honey processing and marketing industry. According to latest statistics Ukraine is ranked as the number one country in Europe for the production of honey, producing 75 thousand metric tons annually which is about double that of the major producers in the EU.

The minimum size for a profitable commercial bee farm is considered to be 100 honey bee colonies. On the average, most of Ukrainian bee farms have around 300 honey bee colonies.

According to the beekeeping statistics, the last few years have seen an increase of honey-bee colonies in Ukraine to the present level of 5 million. On average a hobby beekeeper has between 20 to 25 hives, while what one may call sideline beekeepers have from 50 to 100 honey-bee colonies.

Total output is obviously a variable figure depending on a number of factors. A maximal honeyflow depends on climatic

Traditional, well cared for Ukrainian hives in a fruit orchard.

and natural conditions, the professional skills and qualifications of the beekeepers, the location of beehives and the forage available. A characteristic feature of Ukrainian beekeeping is the migration of apiaries to a planned schedule. The average yield per colony given in official statistics seems optimistically high at 55 -60 kg of honey when compare with EU figures where Finland, with the benefit of the midnight sun, reaches a claimed average of 45 kg per hive and the average across the whole of the EU is 15 kg per hive. In some regions 150 kg/from one colony is not unknown. Every year the NGO, the Brotherhood of Ukrainian Beekeeping, conducts professional level studies training for Ukrainian beekeepers.

Beekeeping techniques and methods cover the full range from the traditional log hives to ultra modern commercial concerns. There are many queen rearing and package bee enterprises, while modern commercial honey farming techniques are widely practised.

Favourable climatic terms and the variety of natural zones predetermine the rich, high quality assortment of honeys produced. The most important and popular honeys in Ukraine are sainfoin, sweet clover, buckwheat, *echium vulgare*, (Viper's Bugloss), linden, thistle, sunflower and general monofloral honey. But the most well-known and wide spread honey is from acacia blossom. In the different regions of Ukraine tastes for and the availability of different honeys varies. The western part of Ukraine consumes buckwheat honey while in eastern areas acacia and linden honeys predominate. In the South the main honey flower is sunflower, the Central Ukraine – has buckwheat and sunflower, in the north it is red clover and forest herbs, while in the mountain region of the west there is honeydew and winter rape.

The most popular honey in Ukraine is sold under the trademark *Medyana rosa*. This brand has received more than 50 awards at numerous international and professional competitions. The export price of honey is totally dependent on world prices. The largest market operators are actively working on expanding the existing sales channels and increasing their representation in the retail and trading networks. Export to the European market includes: Germany, Poland, France, Slovakia, Spain, Hungary, Austria, Czech Republic, Cyprus, Estonia, Switzerland, Italy, Denmark all of whom have significant honey output but cannot meet their own needs. Another market for honey products is located in the former USSR, namely Russia, Belarus, Azerbaijan, Moldova. In addition, a significant proportion of honey is exported to the United States, Panama and Canada.

In the next few years, there is talk and expectation that the growth of export of honey will grow by a phenomenal 30 to 40% per year. The aspiration is that this will be achieved through the potential of the European markets. There is much anticipation that the forthcoming International Apimondia Congress will be a major opportunity to increase Ukrainian honey exports in the world.

Richard Jones
IBRA Director Emeritus, Editor *Bee World*.
Email: joneshr@ibra.org.uk

Some attractively back-lit prize winning Ukrainian honey.

Apimondia President Gilles Ratia with happy Ukraine beekeepers and placid bees.

IBRA BEEWORLD Project

Julian Rees

In the March issue of *Bee World* (Vol. 90, No.1) IBRA Operations Director laid out his vision for the BEEWORLD Project. This is aimed at promoting and conserving bees and starts with the upcoming generations who have shown abundant enthusiasm in the pilot schemes undertaken as the project is rolled out.

Primary school children in Newport, South Wales (left) and Ashland, Oregon, USA (right) get enthusiastic about IBRA's Beeworld Project.

The IBRA BEEWORLD Project visited Somerton Primary School in Newport, South Wales in April.

Year 5 teacher Maria Andrews contacted IBRA following the news feature on UK BBC television in late March. The school had been studying various types of bees over a number of weeks before the IBRA visit and had also been planting a garden area suitable for bees and other pollinators.

The school was given a presentation about the work that IBRA does globally and the aims of the BEEWORLD Project. The visit was supported by Cardiff and Vale Beekeepers who brought along various artefacts for the children to look at as well as an opportunity to look at Varroa through a magnifying glass.

The children were aware of apiculture's current hot topic namely the ban on Neonicitinoids and were keen to ask many questions during the day. Surely, positive evidence that scientific issues are now debated by children at the age of nine.

Somerton Primary and many other schools have developed an interest in bees and beekeeping over the past year and are delighted to see that IBRA has produced an accessible education pack and programme to work with schools and local beekeepers.

As the BEEWORLD project attracts more following via our website and social media, IBRA has linked up with schools and bee education teams across the globe. One of such bee education programs is run by Sarah Red-Laird, Executive Director of Bee Girl in the state of Oregon. The Bee Girl runs events for children as well as a summer camp through ScienceWorks Hands-on Museum. Most recently the program has linked up with the American Bee-keeping Federation Conference to further promote the work.

Sarah Red-Laird is enthusiastic about the BEEWORLD Project and is keen to promote it's cause with both children and adults on each of her training events.

The BEEWORLD Project aims to:

- Inspire and educate the next generation of scientists and bee-keepers through schools.
- Support conservation of declining species in the UK and Europe.
- Promote sustainability through beekeeping in the Developing World.
- Helping research scientists in developing countries get their voices heard.

Julian Rees.
IBRA Operations Director
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IBRA News

IBRA Annual General Meeting

Notice is hereby given that:
The Sixty-fourth Annual General Meeting of International Bee Research Association will be held at **15:30 hrs** on **3rd August 2013** at:
Unit 6, Centre Court,
Main Avenue,
Treforest,
CF37 5YR

Agenda

1. To approve the minutes of the 63rd Annual General Meeting.
2. To receive the **Chairman's Report.**
3. To receive the **Report of Council** and the **Accounts for 2012.**
4. To elect **Members of Council.** The following Members of Council retire by rotation and, being eligible, offer themselves for re-election:

Adriana Allippi,	Fani Hatjina
Peter Neumann,	Mitsuo Matsuka
Robert Paxton	Dewi Rowlands
Karl Showler	David Smith

Council proposes that the number of Members of Council shall remain at 23 for the time being.

5. Messrs Huw J. Edmund, Chartered Accountants, will continue as **Reporting Accountants**.

By order of the Council
David Smith, Secretary of IBRA.

Article 43 of the Articles of Association provides:

No person not being a member of the council retiring at the meeting shall, unless recommended by the council for election, be eligible for office on the council at any general meeting unless within the prescribed time before the day appointed for the meeting, there shall have been given to Secretary notice in writing, by some member duly qualified to be present and vote at the meeting...of his intention to propose such a person for election, and also notice in writing of his willingness to be elected. [The prescribed time is between 7 and 28 days].

A member entitled to attend and vote at this meeting may appoint a proxy to attend and, on a poll, to vote in his stead. A proxy need not also be a member of the company. Proxies must be lodged at least 48 hours before the meeting.

New Offices

After over 28 years in North Road, Cardiff, IBRA has moved to a new location: Unit 6, Centre Court, Main Avenue, Treforest, CF37 5YR.

As anyone who has changed houses knows moving is a major upheaval and rarely without a certain amount of disruption and trauma. However, we are now almost completely installed in our light and airy office space on a business park some eight miles north of Cardiff City centre.

It is the first time in its 64 four year history that the Association has had the luxury of a purpose built building. The ground floor is taken up by the IBRA book shop and book store. The middle floor is an open plan office with work stations for:
Tony Gruba (Finance Manager)
Sarah Jones (Publications Manager),
Diane Griffiths (JAR Editorial Assistant)
Richard Jones (Editor *Bee World*).
On the top floor is the office of Julian Rees (Operations Director) which also serves as a meeting and conference room.

The Annual General Meeting will be held in the offices on Saturday, 3rd August and members are welcome to come and look around. To find us turn north off the M4 at Junction 32 onto the A470 then, after a couple of miles, take the second exit.

IBRA in Turkey

The Fifth Marmara Beekeeping Congress organized by Uludag University's, Faculty of Veterinary Medicine took place in Bursa, Turkey between the 4th and 6th of April. I was one of the keynote speakers at the meeting which brought together academics, researchers and beekeepers.

Topics included breeding varroa tolerant bees, pests and predators, queen rearing, honey analysis and apitherapy. There was a great emphasis on practical work and afternoon workshops often continued long into the evenings. As well as encouraging participation in the more practical aspects of beekeeping there were also poster presentations and an exhibition area where Jane once again looked after an IBRA stand.

Richard Jones

Prof Dr Ibrahim Cakmak (second in on left) head of the bee unit with colleagues and visitors.

The Back Page

Events 2013

Heartland Apicultural Society Annual Conference — **11-13 July**
Tennessee Tech University,
Cookeville,
Tennessee, USA

FIBKA Summer School — **21-26 July**
Gormanston, County Meath,
Ireland

Eastern Apicultural Society — **5-9 August**
West Chester University,
Pennsylvania, USA

Congreso Mesoamericano De Abjas Nativas — **26-31 August**
Heredia,
Costa Rica.

Apimondia 2013 — **29 September-4 October**
Kyiv
Ukraine

Western Apicultural Society Annual Conference — **16-19 October**
La Fonda Hotel on the Plaza,
Santa Fe,
New Mexico, USA

National Honey Show — **24-26 October**
St. George's College,
Weybridge, England

Early Warning

Apimondia - International Congress — **15th-20th September 2015**
Daejong,
South Korea

Apimondia 2011, Apicultural Magazines - Bronze medal winner *Bee World*

Bee World

ISSN 0005 772X

Volume 90 Number 2
June 2013

Contributions

We invite submissions, which we will consider for publication in future issues. Please send potential articles of interest to the email below.

If you would like to discuss your article and ideas, do not hesitate to contact us. We would be particularly willing to help authors whose first language is not English.

In other words please get involved. We want to produce a journal that reacts to, and is interactive with, its readership .
beeworld@ibra.org.uk

Sponsorship

There will be four issues in a year – March, June, September and December and it is our aim that each one has a single sponsor with sole advertising rights. If you are interested in supporting one or more issues then please contact Richard Jones:
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BOOKSHOP

June 2013

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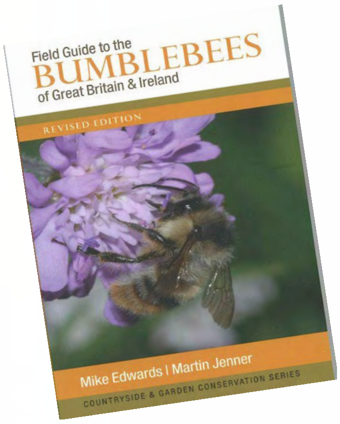

Field Guide to the Bumblebees of Great Britain & Ireland

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Backyard Beekeeping and Honey Production

P Rant

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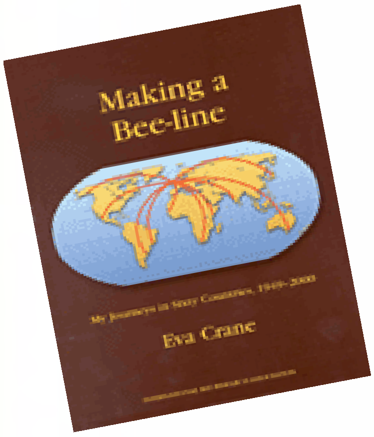

Making A Beeline: My journey in 60 countries.

E Crane

After a lifetime in pursuit of bee knowledge Dr Crane recounts the journeys behind the quest. From dog sled journeys at -20C to floating down the Mekong in a dug-out canoe, it's packed with fascinating tales.

£5.97 (R.R.P. £9.95)

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A Ozkirim

This popular and colourful children's book contains 9 chapters, and brings together the reality of life in the hive with the magic that the bees create as they go about their daily business.

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