

Research Summary Note

Beekeeping Knowledge, Honey Bee Health and Environmental Stewardship: A Cross-disciplinary Study

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This Research Summary Note

This is a summary of a 4 year PhD research project, funded by a ESRC-NERC studentship, and carried out at Lancaster University, UK. This Research Summary Note is made available in order to share the key findings of the research with stakeholders in an accessible format. The complete research write up is available as a PhD thesis from Lancaster University Library.

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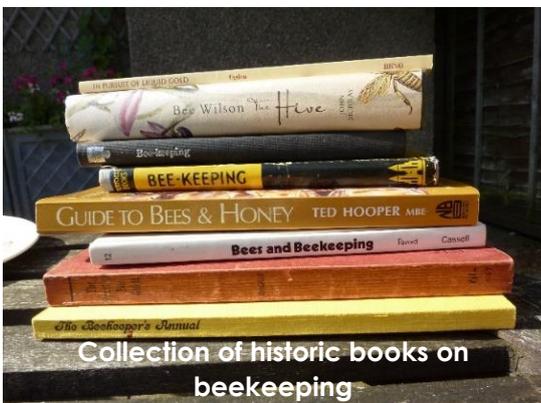
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Introduction

Beekeeping is a skilled and ancient craft. Today, beekeepers play an essential role in managing honey bee populations during a period when honey bees and many other insect pollinator species are declining. Honey bee populations have seen drastic declines in North America and Europe since the winter of 2006/07. These declines have contributed to increased concerns over global and local food security, encouraging researchers and policy-makers to focus on understanding the causes of, and finding solutions for insect pollinator declines. One obvious way to do this has been to engage with stakeholders involved in management of insect pollinators.

'Beekeeping is a science, a vocation and a craft. Some, having the vocation, attain a measure of proficiency in the craft without designedly studying the science. Others concentrate on the science, hoping thereby to attain craftsmanship, but they seem to lack that touch of art or sympathy which clothes bare facts with life.'

(extract from 'The Bee Craftsman', H. Wadey 1947, p.27)



Collection of historic books on beekeeping

In the UK, beekeepers have a long-standing and intimate relationship with honey bees, especially as many feral and wild colonies have died out as a result of varroa mites¹. Partly because of this challenge, beekeepers have become a community that the statutory organisations responsible for bee health in the UK (particularly the National Bee Unit) have sought to engage with over bee health management, e.g. through programmes such as the Healthy Bees Plan².

Yet, to date, little research has been carried out on the beekeeping community itself, despite the fact that it is through the day-to-day actions of beekeepers that honey

bee colonies are maintained and supported. The majority of research into honey bee declines has been ecological or biological, and has ignored the potential contribution of knowledge held by non-science stakeholders (such as beekeepers) for understanding and managing honey bee populations. Hence, this study was conceived to address this research gap. It specifically set out to investigate:

- 1) The details of beekeeping knowledge and practice, to develop a clear understanding of daily beekeeping activities, especially those around bee health
- 2) To study how this knowledge and practice compares to the assumptions, expectations and priorities of policy-makers and other stakeholders engaged with honey bee health and management,
- 3) To look for ways in which beekeepers, policy-makers and scientists could potentially work together more closely on bee health management

The results of the work are presented in the following Research Note. The findings from the study suggest that more attention needs to be paid to the complex reality of managing bees when developing policy advice for beekeepers and other groups who have influence on honey bees, or when seeking to engage beekeepers in policy or scientific work.

¹ Thompson, C., Biesmeijer, J., Allnutt, T., Pietravalle, S., Budge, G. 2014. Parasite pressures on feral honeybees (*Apis mellifera* sp.). *PLoS ONE*, 9: e105164

² Department for Environment, Food and Rural Affairs (DEFRA). 2009. Healthy bees: Protecting and improving the health of honey bees in England and Wales. March 2009. Department for Environment, Food and Rural Affairs, London.

Methods

The research that was carried out using a ‘mixed methods’ or ‘cross-disciplinary’ approach. This combines natural science methods such as bee feeding experiments with social science, human geography and anthropological methods such as interviews with stakeholders, observations of beekeeping activities at apiaries and other beekeeping locations, and examination of beekeeper diaries.

This sort of approach is increasingly employed in environmental contexts where issues are ‘hybrid’ and linked to both environmental processes and human activities – also called ‘linked socio-ecological systems’.

‘In the old bee gardens... it is pleasant to sit with the proprietor under the rosy shade of apple-boughs waiting for the swarms to issue, and ‘talking bees’, which is the most nerve-soothing, soul-refreshing occupation in the world. There never was a bee-keeper, new style or old style, too busy to talk, provided that you met him with understanding, and were as impatient as he of digressions from the all-important theme’

(extract from ‘The Lore of the Honey-Bee’, T. Edwards 1929, p.125)

Until now, research on insect pollinators has focused on understanding the biological and ecological aspects of individual species, and the consequences of environmental changes on those species. However, because the management of honey bees involves a particular human stakeholder group, beekeepers, it is important to ensure that beekeeping knowledge and activities, themselves developed over decades of experience and experiment, are considered in policy and science work on managing honey bees.



Carrying out feeding experiments

Thus, this project aims to both open up new perspectives on honey bee health through greater acknowledgement of the role of beekeepers in this, whilst retaining the great wealth of knowledge about honey bees that has been gathered through biological and ecological experiments and observations.

A mixed methods approach is, however, less likely to provide in-depth knowledge about a specific element of an issue – so it is very well suited to understanding the dynamics of beekeepers, policy-makers and bees, but not suited to in-depth studies of a particular disease or pest.

Research process facts and figures

42 hobby beekeepers interviewed	6 diaries collected	2 surveys sent out	5 BBKA committee members interviewed	23 beekeepers involved in feeding experiments
5 commercial beekeepers interviewed	6 policy makers interviewed	2 academics interviewed	30 beekeepers involved in pollen trapping	1 academic paper written (so far)

How to become a beekeeper: learning and skill in managing honeybees

This chapter is published as: Adams, E. 2016. *How to become a beekeeper: learning and skill in managing honeybees*. *Cultural Geographies*, DOI: doi.org/10.1177/1474474016682345

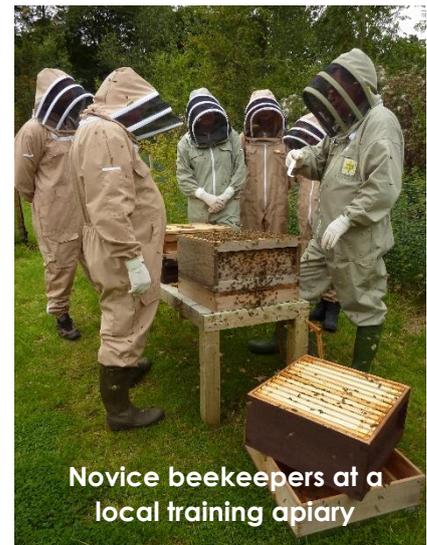
Beekeeping is a highly skilled activity with specific practices such as housing bees in artificial hives dating back centuries. Whilst often regarded as ‘traditional’, beekeeping in the UK has experienced a surge of interest since 2005, reflecting a wider societal awareness about the role of insect pollinators in human food provision.

Many of these new members are novices, with little beekeeping experience. Since 2009, concern over the impact of an influx of inexperienced beekeepers on bee health has brought policy-makers and beekeepers together to ensure that beekeeping maintains training standards and new beekeepers are able to look after their bees properly. One such partnership is the Healthy Bees Plan (HBP), jointly written in 2009 by the NBU and various beekeeping organisations to facilitate beekeeping stakeholders to work together to ‘achieve a sustainable and healthy population of honey bees for pollination and honey production’ (Defra 2009 p.6).

However, the reality of learning beekeeping is not as simple as just taking a course. It requires individuals to develop skills in handling bees, to learn to interpret the inside a hive and observe key features such as indicators of disease and evidence of food supplies. Beekeepers then have to bring these observations together with a knowledge of bee biology and life cycle, the relationship between bees and their environment, and the consequences of beekeeping activities on bee health. The learning process is therefore complex, requires significant input from trainers, and also a strong commitment from the learner to deal with the emotional and practical challenges inherent in managing bees.

The emphasis of the HBP on standards, beekeeping exams and the development of formal training systems sits at odds with the nature of beekeeping as an activity attuned to the needs of the bees, the local climate and the particular colony being managed (including its history of varroa treatments, honey extraction, splitting, re-queening and all the other elements of beekeeping).

Another factor is that learning to keep bees is enhanced through ‘hive time’ and ‘peripheral participation’ – opportunities for novices to get involved in beekeeping with the support of more experienced beekeepers. As clubs have absorbed larger numbers of novices and adopted more structured and formal training methods, training courses can struggle to provide enough practical ‘hive-time’ – an important gap that becomes apparent when novices acquire their first colony. Many novices require support from mentors and peers as they apply theoretical learning and limited practical experience from training courses to their own hives. As a result, novices can end up being anxious over the uncertainty inherent in learning to manage bees, and often end up criticising their training. In addition, the narrow focus on training and acquisition of skills – sidestepping the vast array of beekeeper experiences and motivations - has implications for how beekeepers perceive their role as managers of honey bees, as the next section discusses.



Novice beekeepers at a local training apiary

Beekeepers and environmental stewardship

Honey bees have become a symbol of environmental problems and the need for greater connection between people and the environment. Insect pollination of crops has become an important topic for UK food security and policy. **Due to their close relationship with honey bees, beekeepers are increasingly seen within policy organisations such as Defra as ‘stewards’ of honey bee populations who ensure that honey bee pollination continues and benefits growers, consumers and society generally³.** However, being labelled as an environmental steward does not necessarily mean that your personal interests match the needs and expectations of government departments or charities tasked with managing the environment.

For many beekeepers, beekeeping is their hobby, undertaken for (amongst other reasons) relaxation. Beekeeping communities are typically diverse, bringing together people from many different backgrounds and interests. **These two factors are important to recognise when labelling communities as ‘stewards of the environment’, because individuals within the community may have very different motivations and interests in undertaking beekeeping, and not all of these will relate to environmental and pollination topics.** So, although most beekeepers are fully aware of the role of honey bees in pollination, not all of them undertake beekeeping in order to support pollination: instead, beekeeping activities such as honey production, creation of beeswax and honey-related products, collection of beekeeping-related memorabilia (e.g. books, honey pots) and just general leisure may be more important reasons for beekeepers to pursue their way through the beekeeping learning process, and to keep beekeeping even in poor summers and when new diseases and pests like varroa affect their colonies.

This diversity sets up a potential conflict when government and other stakeholders make assumptions about who beekeepers are and why they keep bees. Beekeepers do not always share the same perspectives on biological and ecological topics with ecologists or conservationists: for example Himalayan balsam, a species regarded by most of the conservation community as invasive and problematic, is frequently hailed as a great honey and pollen resource for beekeepers in areas where other resources are scarce (e.g. urban areas). **Thus, beekeepers are complex environmental actors – sometimes aligning with government and environmental interests, and other times not.** Being sensitive to this complexity will facilitate constructive conversations between beekeeping and other stakeholders.

Having noted this, this research also found that for some beekeepers, taking up beekeeping had encouraged them to engage more closely with nature and to be more aware of, interested in and caring about their local environment. Some bee clubs and individuals in the region have undertaken planting schemes to support native wild flowers, others have engaged on topics such as municipal mowing regimes and farmer land management. **This sort of ‘inadvertent environmentalism’ is an interesting result of beekeeping, and could be encouraged by both the beekeeping and statutory communities, for example by being given greater prominence within existing beekeeping training materials.**

Honey bee feeding on, and in the process pollinating, a dandelion



³ Department for Environment, Food and Rural Affairs (DEFRA). 2013. Improving honey bee health: proposed changes to managing and controlling pests and diseases. January 2013. Department for Environment, Food and Rural Affairs, London

Managing honey bee health

Bee health links both of the previous sections: beekeepers are being trained to ensure good standards of bee management, because honey bees play an important role in pollination. Healthy bee colonies are crucial to both successful pollination and successful beekeeping. Honey bees are vulnerable to a wide array of diseases and pests which can cause colonies to die or can cause long-term declines. The UK has a strong expertise in bee disease management, with expert inspectors tasked with regular and careful disease inspections of colonies. The bee inspectorate forms part of a wider UK biosecurity approach, applied to animals and plants, and builds on EU and international laws around importing and managing diseases and pests that typically involves a prevention-isolation-eradication approach, where diseases and pests are ideally prevented from arriving, but on arrival are isolated and ideally destroyed, and where total eradication is the target.

Honey bees provide five serious challenges to this approach, which has been developed primarily based on farm animals and agricultural plants:

- 1) Unlike many domesticated animals, honey bees are highly mobile, flying freely to forage for food and to mate. Direct and indirect contact (e.g. plant visits by successive bees or bees entering the wrong hive) provides many opportunities for bees to mix and share diseases and pests.
- 2) Beekeeping typically involves regular movement of bees and equipment, between hives, between apiaries and between beekeepers – this flexibility allows beekeepers to manage colonies but also provides routes to share diseases and pests.
- 3) Honey bee colonies are very resilient – their colonial structure and honey/pollen storage means that colonies can withstand the loss of worker bees for some time before problems are visible, and often hive collapse can happen very rapidly after a problem is identified. Additionally, the microscopic nature of diseases like *Nosema* challenges beekeepers by requiring a microscope to diagnose them. The bee inspectors play a key role here in identifying problems, using their expertise to spot issues which a beekeeper may never have previously encountered.
- 4) Honey bees are highly attuned to their environment and vulnerable to changes – a poor season (cold/wet) can seriously affect bee foraging and thus feeding of bee larvae, or cause honey stores to be used up more rapidly than they can be replaced. Furthermore, if colonies are located in forage-poor areas, this can also cause problems.
- 5) Beekeepers themselves can be problematic – multiplying colonies, removing honey or treating for diseases are all stressful processes which can exacerbate undetected problems for a colony, or which can combine with other factors (such as a spell of poor weather) to trigger problems.

The presence of diseases and pests is increasingly understood as an issue of ‘borderlines’ and grey areas rather than simple presence/absence. Latent, or low-level and undetectable levels of disease are common and able to flare up even in bee colonies (and other species) in response to slight changes in factors such as weather or stress. **Honey bee disease management is complex, and their unique management and life history requires a sensitive approach – something beekeepers are keen to deliver, but which can be difficult to do without awareness of issues such as environmental factors, nutrition and beekeeper impact.**



General conclusions

1) It is important to place more emphasis on the needs of learners, appreciating the individuality of novices, their motivations and what they could bring to the community in terms of experience, skills and ideas from other parts of their lives. As part of this, a greater emphasis on small group learning and extended practical experience prior to novices acquiring their own hives could ameliorate problems associated with a mismatch in trainer and mentor numbers and demand for training and mentoring. **Beekeeper training could also place greater emphasis on the environmental aspects of beekeeping, making clearer the effect of the environment on the health of colonies, and thus helping beekeepers manage their colonies.** For example, training course providers could encourage beekeepers to talk to their neighbours and local land owners about how they could manage their properties to better support pollinators (and associated benefits), thus assisting beekeepers with honey bee nutrition.

2) There is a need for greater focus on coherence at the policy-level over the management of the wider environment for pollinator health, e.g. the use of pesticides and how land-management decisions affect honey bees and other insect pollinators. In particular, pesticide use should be part of a wider discussion about how agricultural environments are managed to balance the need for food production and the need for biodiversity and wild habitats which support ecosystem services like pollination. **If stakeholders like beekeepers are to be adopted as environmental stewards, it is not enough for policy-makers just to focus on beekeepers and how they manage diseases and pests.** The wider environment has an important influence on bee health, and beekeepers can only do so much at an individual or community scale to mitigate against the effects of landscape changes brought about by changes in farming practices that, for example, remove wild flowers.

3) It is important to consider how statutory and beekeeper communities collaborate on research and how knowledge from different groups is used. Beekeepers expressed concern about research programmes such as the Insect Pollinator Initiative; beekeepers could see that research on the wider community of insect pollinators was valuable, but expressed a firm desire for more research on beekeeping issues. **Beekeepers pointed out that they could have a lot to contribute to research in terms of ideas and help, but have little opportunity to share these ideas directly with researchers and scientists.** Beekeepers commented on a lack of communication and feedback on results from scientists doing research on honey bees to beekeeping communities, even when scientists had solicited for samples from beekeepers' hives. Other studies of stakeholder engagement with science and policy indicate that concerns such as these are not uncommon, as engaging with policy and science is often on the terms of the policy-makers and scientists, and stakeholders are often limited in their capacity to influence research processes and resultant decisions. **These comments suggest that there is room for improvement in the way in which beekeepers, as a highly specialised, valued stakeholder group, are included in policy and research.** It is also important to recognise that many beekeepers are happy to collaborate when they can see the benefits for themselves, but it is important for researchers and policy makers to take into account their concerns, interests and ideas and to be open to changing research ideas or protocols to acknowledge these – otherwise, resentment and confusion can result in partnerships being broken.

This research has sought to present beekeepers as complex, skilled and diverse stakeholders with a lot to contribute to ongoing concerns over honey bee management. It is worth remembering that, despite the disagreements and mismatches documented here, beekeepers and other honey bee stakeholders like the BBKA and the NBU share a desire to have healthy honey bees. By identifying areas where perspectives and opinions may differ, it is hoped that these can be potentially mitigated in order for the future management of honey bees to be improved.



'Observation of the ways of the honey-bee has been carried on for thousands of years. More books have been written about the bee than perhaps of all other creatures put together. And yet our knowledge of her powers and organisation must still be reckoned in its infancy'

(extract from 'The Lore of the Honey-Bee', T. Edwards 1929, p.107).



Images from the fieldwork undertaken for this research

Top row L-R: Smoker; inspecting a colony; bees on a frame; honey show exhibits

Bottom row L-R: Inspecting a top bar hive; Inspecting a club apiary in teams; hives in heather moorland; nutritional experiment

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