What are inspectors seeing today compared to 10–20 years ago

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In many ways the role of the National Bee Unit (NBU) inspector remains the same today as it was 10–20 years ago. We still work with a wide variety of beekeepers and husbandry methods, we still encounter many of the same diseases and pests, and we still get stung! That said, much has changed; there are more beekeepers, new tools and technology, new processes and methods, new pests and diseases, and new legislation to keep us on our toes. Through interviews with past and current bee inspectors and analysis of our BeeBase database, we have highlighted the major changes and the key themes that emerged.

Technology

Even a decade ago a lot of our work was remarkably analogue – lots of paper, lots of forms, and lots of lists. A bee inspector arriving at a hive with a hive tool in one hand and a shiny iPad in the other would have been unheard of. The use of our laptops, tablets and smartphones not only enable us to streamline our communication with beekeepers (most of whom lead busy lives) but also allow us to effectively triage any potential disease problems that beekeepers may encounter during inspections. In the past, inspectors spent many hours making phone calls, leaving messages, or writing letters to book an inspection appointment. One inspector even recalled an unnamed colleague whose wife made his appointments for him. The use of messaging applications allows a quick exchange of pictures with a beekeeper who thinks they might have spotted foulbrood in their hive, enabling a swifter and more targeted response by the inspector (and without the need for a 100-mile round trip).

In 2009–10, Defra and WAG (Welsh government) asked the NBU to "establish a clear picture of pest and disease prevalence across England and Wales". A Random Apiary Survey (RAS) was conducted of 4,600 apiaries. Nucleic acid was extracted from adult bee samples collected from every apiary and analysed for eight viruses (including deformed wing virus and chronic bee paralysis virus), three fungi (including *Nosema ceranae*), two bacteria (the foulbroods), and tracheal mite.

The data was used to evaluate the capacity required to detect disease. Analysis showed that we were targeting inspections quite well but were under-resourced. The number of beekeepers has continued to increase with more than three times as many being registered on BeeBase than

in 2009. This has driven investment in tools and methods to increase the effectiveness of our inspection programme.

Inspectors are now supported by a BeeBase RAG (red amber green) list that categorises and prioritises their work. The list is generated from a scientific risk-based model which calculates which apiaries are due most urgent attention. For example, inspections include six-week follow-up inspections after foulbrood diagnosis, other apiaries belonging to a beekeeper whose colonies have tested positive, apiaries with a recent history of foulbrood disease, and apiaries of other beekeepers within a 5km radius of a confirmed case. Prior to the introduction of the RAG list, inspectors relied on a mixture of experience, expediency and geographical viability – often supported by a giant map covered with coloured pins and bits of string.

Husbandry

By spending their working lives with a wide range of honey bee enthusiasts, our inspectors are well-placed barometers of change in beekeeping methods. The internet provides beekeepers with access to a wide range of educational information sources. This is a significant change to when there was a traditional reliance on the BKA library or a local oracle of apicultural knowledge. Many beekeepers now benefit from the online winter lecture series offered by many beekeeping organisations, which owe their success to generally good access to decent broadband in the UK.

The flipside to the openness of the internet is of course its uncensored broadcasting of information of varying degrees of competence and veracity. Some online advice that our inspectors see is questionable to say the least and beekeepers need to consider the possible inaccuracy before putting it into practice. Watching a YouTube video is no alternative to taking a course or receiving mentorship from a more experience colleague; a fact not always recognised by some novice beekeepers.

The past 20 years have seen a barrage of innovation in beekeeping equipment and hive types, with inspectors increasingly encountering polystyrene hives, plastic hives, plastic frames, plastic foundation, Flow Hives, top-bar hives and even the occasional Sun hive. One inspector recently had to extract small handfuls of brood comb from a colony that had been housed in an unopenable plastic box.

Awareness

Awareness of the decline of pollinators has undoubtedly increased significantly over the past 20 years, and this has had a consequential effect on the motivation of many people to take up beekeeping to 'save the bees'. The honey bee has become the poster boy (or girl) for eco-conscious interactions with pollinating insects. The notion that the simple act of housing bees is beneficial to the environment is, however, unfortunately misguided. The species truly threatened with extinction from habitat and forage loss are the UK's solitary and bumblebees. Adding competition in the form of domestic honey bees does nothing to benefit these pollinators. Through the *Healthy Bees Plan 2030*, the NBU is keen to emphasise that the most important thing for honey bees in the UK is for them to be kept well and with a good and developing knowledge base.

The effects of climate change are very much present in the UK, and its effects on beekeeping are becoming ever-more apparent. One former inspector with over 50 years of beekeeping experience described how increasingly changeable weather patterns and prolonged periods of heat or rain have made beekeeping increasingly challenging for novices. There is increased risk of mid-season starvation, variability of queens mating, and the lack of a reliable broodless period when certain varroa treatments have maximum efficacy. As our climate warms and our historically temperate weather system becomes subject to extreme weather events and increasing uncertainty, beekeepers will have to become ever-more adaptable and knowledgeable to deal with the effects on their bees.

Varroa

The varroa mite remains the number one threat to beekeeping and parasitic mite syndrome is encountered all too frequently by inspectors. Beekeepers now have a wide range of chemical treatments available to them and so it is a shame that some still feel the need to invent their own treatments and take the risk that these pose to honey bees, the environment and humans. There seems to be a growing understanding of the role of biotechnical methods in managing varroa numbers (for example shook swarm). Some honey bee colonies are demonstrating the ability to deal with mites. A small but increasing number of beekeepers successfully keep treatment-free bees in the UK. That said, success relies on careful observation and management because, in most cases, simply stopping varroa treatment will result in the death of the colony.

The foulbroods

The NBU is charged with controlling American and European foulbrood (AFB and EFB). Both are present in the UK and can lead to the death of infected colonies. Both foulbroods are statutory notifiable diseases, so beekeepers are legally obliged to report any suspected diseased colonies under the Bee Diseases and Pests Control Orders 2006.

EFB has remained a persistent problem despite annual fluctuations in the number of cases. Each year a significant amount of inspectorate time and effort is invested in managing outbreaks of this disease.

There have been changes in the prevalence of the treatment methods we use for EFB-infected colonies with a reduction in the use of the antibiotic oxytetracycline (OTC) and an increase in the use of destructions and the use of shook swarms (a husbandry-based method, using comb replacement) as a drug-free control option. The EFB disease reoccurrence rate of OTC treatment is approximately five times that of shook swarm management (Waite et al 2003, Budge et al 2010) because the former only prevents bacterial growth rather than killing the bacteria. OTC is also known to persist in honey as a residue for up to 32 weeks (Thompson et al 2006) and causes significant open brood mortality of up to 48% (Thompson et al 2005).

AFB continues to be found every year but at a much lower incidence than EFB. Destruction remains the only control option.

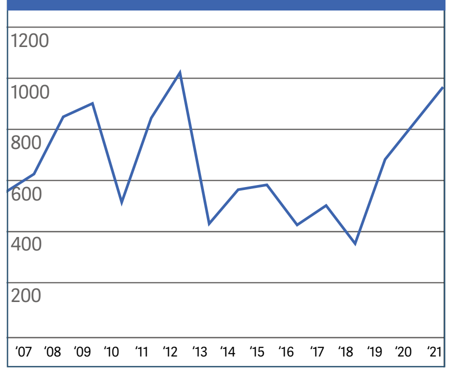
EFB is considered a disease of the apiary because the causative bacterium *Melissococcus plutonius* is often present in associated non-symptomatic colonies. This leads to a higher chance of recurrence than is associated with AFB. To address this, Bee Diseases Insurance (BDI), in conjunction with the NBU, launched a Whole Apiary Shook Swarm Trial in 2021. This offers BDI-insured beekeepers the opportunity to have their inspector shook swarm the bees from non-symptomatic colonies on to fresh comb as well as treating the symptomatic colonies. This action removes the significant proportion of bacteria present in the brood, stores, and wax. We encourage all beekeepers to discuss this option with their inspector if they have confirmed EFB in their apiary.

Each year, every foulbrood sample collected by inspectors has been genetically analysed by the laboratory to identify the bacterial strain responsible for the disease. Scientific analysis has provided useful information on matters such as the emergence of new strains, the geographic diversity of strains, and the role of beekeepers in moving strain types around the country. It is hoped that further scientific investigation will allow us to uncover information regarding the suitability of different control methods for individual strains.

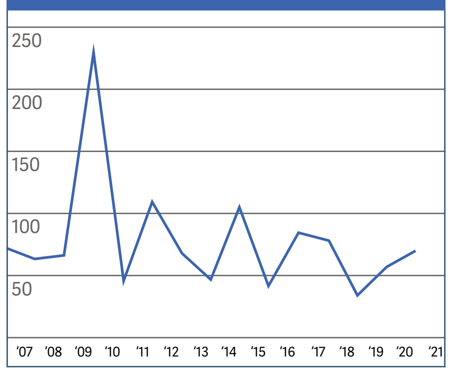
Asian hornet

The yellow-legged Asian hornet (*Vespa velutina*), referred to as Asian hornet for simplicity in this article, is native to much of Asia and queens first arrived in Europe in 2004 in south west France. Since then, it has spread throughout most of mainland Western Europe, the first nest being discovered in the UK in 2016 (Budge et al, 2017). Genetic analysis, carried out on every nest and hornet caught away from a nest in the UK, has established that no nests have been descendants from another discovered nest or descendants from a common parent nest. Additionally, all the hornets caught in the UK have originated

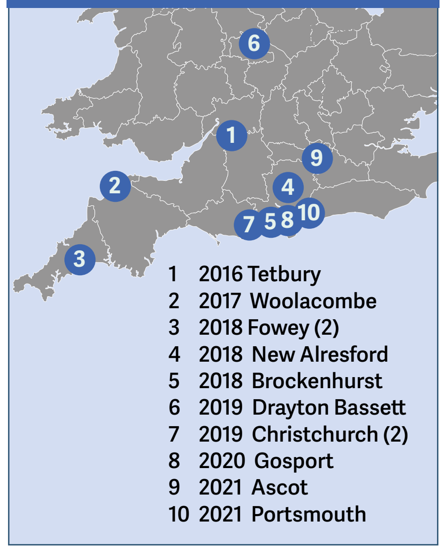
EFB outbreaks



AFB outbreaks



Distribution of the Asian hornet nests found and destroyed in the UK



1 Shook swarming in action
2 Disinfecting a hive roof with a blow torch
3 Testing for foulbrood
4 Deactivating an Asian hornet nest and send it for laboratory analysis
5 Bee inspectors in Ascot at an Asian hornet track-and-trace incident

from France rather than being separate ingresses from Asia (Jones et al, 2020). The diagram on the previous page shows the distribution of the Asian hornet nests found and destroyed in the UK.

The Asian hornet preys on a wide range of insect species including important pollinators. In Southern Europe, it can reach densities of 10–15 nests per square kilometre. However, in the UK there is currently no evidence that the Asian hornet has become established, mainly a result of the eradication strategy and rapid response to confirmed sightings.

To enable a rapid response and increase its efficiency, the NBU has learned from each ingress. Key improvements include distribution of contingency equipment in each of the eight NBU regions, training of staff on track-and-trace techniques, and the development of a geographic information system-based app. This app aids track and trace and each inspector can enter bait station and trap position as well as line-of-sight information on hornets. This can then be mapped and shared instantaneously with colleagues both in the field and office. So, responses now usually only take a few days from reported sighting to destruction of the nest and only a few inspectors are required in the field for each response.

Small hive beetle and Tropilaelaps

A few years ago, small hive beetle (SHB) would have been an exotic pest that resided harmlessly in Africa, was relatively unknown and not a pest of concern to bee inspectors. SHB (*Aethina tumida*) is a small, invasive beetle which infests colonies, eats brood, pollen and honey, destroys comb and causes honey to ferment. Without control outside its native Africa, infestation leads to destruction of honey bee colonies.

The first serious incursion of SHB into Europe (September 2014) was identified in the town of Gioia Tauro in Calabria, Italy and, despite the severe controls in place, an apiary was found infested with SHB in Lentini (Sicily) as recently as June 2019. The new outbreak was identified as an unauthorised movement of beehives from Calabria. Control, surveillance and a protection area of 5km radius around the outbreak was established and no new outbreaks have been detected since.

In the UK, early detection of exotic pests is a primary concern for the NBU and a Sentinel Apiary Scheme was set up in 2010 to monitor apiaries near exotic pest risk points. Voluntary Sentinel Apiaries (VSA) are monitored by volunteer beekeepers who submit two samples of floor scrapings/hive debris each season for analysis. Each region now has approximately 15 VSAs. More recently enhanced sentinel apiaries (ESAs) are located near the highest risk points and are inspected three times each season by our inspectors.

The NBU's responsibility also includes inspecting queen imports. During one such inspection this year, an inspector had the unwanted surprise of finding a wriggling larva in the fondant of an imported queen cage. Despite this heart-stopping moment, the established protocols operated smoothly, with the larvae identified by our laboratory in York as a rove beetle larva (of the Staphylinidae family), harmless to bees.

Conclusion

If one thing is certain, it is that the next 10-20 years will bring more change. By registering with the NBU via BeeBase, you'll be playing a very important part in helping to maintain and sustain honey bees for the future. It is important that we know the distribution of beekeepers and apiaries across the country to help us to effectively monitor and control the spread of serious honey bee pests and diseases, as well as provide up-to-date information in keeping bees healthy and productive.

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