

Written evidence submitted by the Royal Botanic Gardens, Kew (INS0044)

This evidence is submitted on behalf of the Royal Botanic Gardens, Kew (RBG Kew), in response to specific questions asked during oral evidence provided by Professor Phil Stevenson in the first hearing of this inquiry on 7th June 2023. This submission includes information and evidence relating to insect decline, with a focus on the impact of urban beekeeping and the role of education – as relevant to the questions asked during the oral session:

- What impact is [the popularisation of beekeeping] having on the wider insect population? Should we be encouraging more beekeeping to take place?
- What work do [your] organisations do to engage with the public to promote greater awareness of insects generally and their role?

Kew background

RBG Kew is a leading botanic garden and plant science institution with 2 sites in the UK – a 330-acre site at Kew in West London, a 535-acre estate at Wakehurst in West Sussex - and a research base in Madagascar. RBG Kew is an arms-length body of Defra and a charity, which receives approximately one third of its funding from Government through Defra, other departments and research councils. Further funding needed to support RBG Kew's vital work comes from donors, membership and commercial activity including ticket sales.

Context

Bees provide between 60 and 70% of all pollination services. The global land area on which insect-dependent crops are grown has tripled in the last 50 years and researchers are clear that managed honeybees alone cannot meet the demand for pollination services. Even if they could, reliance on a single species for the majority of pollination would be very risky, so we need to ensure a diverse and healthy population of pollinators.

There is evidence for decline in some groups of insects including across 33% of bees and hoverflies since 1980. There is no single factor affecting pollinators and contributing to insect decline – rather there are a number of stressors including intensified land use, habitat loss and fragmentation, climate change, pests and pathogens, non-native species, forage nutritional quality and pesticides. High temperatures can make it difficult for some plants to grow, reduce flowering so that pollen and nectar resources are available for less time, or alter flowering time so preferred flowers are not available for certain pollinators.

Research has, until recently, tended to look at single factors in isolation but there is increasing recognition of the need to consider multiple pressures and involve collaborators from different disciplines to understand how these factors collectively affect pollinators such as bees.

1. Urban beekeeping

In order to ensure healthy, thriving ecosystems and address insect decline, habitat and land management approaches should focus on encouraging a diverse range of pollinators.

The State of the World's Plants and Fungi 2020 report by Kew (Antonelli et al., 2020) states that 'Campaigns encouraging people to save bees have resulted in an unsustainable proliferation in urban beekeeping'. The messaging to save bees - which has been in response to evidence of the decline of some wild bee species - has been oversimplified to encourage people to keep honeybees, even when honeybees are not in decline or at risk. This approach only saves one species of bee, the honeybee, with no regard for how honeybees interact with other, native species. In some places, such as London, so many people have established urban hives that the honeybee populations are threatening other bee species. Evidence published by Kew (Stevenson et al., 2020) combines data on registered honeybee hives in London and available floral resources, and indicates that most locations in London have unsustainable numbers of hives. Essentially, these areas are not producing enough nectar and pollen for the existing registered honeybee hives, let alone for the numerous other pollinators and other insects that require these resources.

In some locations there were 50+ hives and in one location, there were 400 hives in 1 square km. We predicted that London can only support 7.5 hives per square km. Our work is supported by evidence from Swiss cities (Casanelles-Abella & Moretti, 2022), where hive numbers increased from an average 6.48 hives per km² in 2012 to an average 8.1 hives per km² in 2018, which then observed that available resources were insufficient to maintain present densities of beehives. Evidence from Germany (Renner et al., 2021) and France (Ropars et al., 2019) shows also that urban beekeeping directly impacts wild bee abundance and wild bee activity, especially within a 1000m halo of the hive.

More recently, evidence from Montreal, Canada (MacInnes et al., 2023) reported a 10-fold increase in honeybee hive numbers between 2013 and 2020 which resulted in significant depletion in pollen availability in the cities and a significant decline in wild bee abundance, especially smaller species, echoing studies in European cities. Smaller solitary bees forage at significantly shorter distances than honeybees (Grüter & Hayes, 2022), which means they are especially vulnerable to competition and habitat fragmentation, and likely more so if they are so called specialists feeding on a restricted range of species.

Even in pristine rural habitat with a high abundance of forage, research in the south of France (Henry & Rodet, 2018) found that 15-30 honeybee hives per km² had a significant impact on wild bee survival and reproductive success.

Thus, responsible bee husbandry is required especially in cities, where measures are needed to reduce and discourage the practice of honeybee keeping and clarify misconceptions about the conservation value of honey-bee keeping.

Honeybees remain an important contributor to food production of some pollinator-dependent crops and are not in decline. Neither are they a significant contributor to insect decline outside of cities where floral resources are more abundant despite evidence above from beekeeping in cities. Ultimately more attention needs to be placed on wild bee species as well as all other important pollinators and insect species more generally.

2. Education

Education relating to the role of pollinators and the need for diverse, abundant insect populations is vital in ensuring there is a continued effort to protect and conserve insect species and to encourage people to take action in their own local environments.

Kew has a dedicated Learning and Participation team, which is committed to sharing knowledge and expertise with schools and other educational organisations, through both onsite visits and online learning tools. This includes content relevant to pollination and insect decline.

In the last financial year (2022 – 2023), over 85,000 school pupils visited Kew Gardens on a school trip with over 45,000 participating in a school-led session. Over 7,000 school teachers are subscribed to the online learning platform Endeavour, which has a reach of c.210,000 pupils.

Kew's onsite education sessions relevant to this inquiry includes:

- **Key Stage 2** (7-11 year olds) – Evolution and adaptation
- **Key Stage 3** (11-14 year olds) – Biology: Field studies; Biodiversity; Ecosystems: Rainforests; Plant reproduction
- **Key Stage 4** (14-16 year olds) – Biology: Evolution and adaptation; Biology: Plant pathogens, pests and diseases; Biology: Field studies
- **Key Stage 5** (16-18 year olds) – Geography: ecosystems – Rainforest; Ecosystems, biodiversity and management; What are ecosystems.

Kew's online education challenges ([through Endeavour](#)) relevant to this inquiry includes:

- **Key Stage 1** (5-7 years old) – seeds and pollinators
- **Key Stage 2** (7-11 year olds) and **Key Stage 3** (11-14 year olds) – super seeds and funky flowers
- **Key Stage 4** (14-16 year olds) and **Key Stage 5** (16-18 year olds) – Tree of Life and Evolve and adapt

In addition to our schools' programmes, Kew also teaches about pollination through:

- Grow Wild: Kew's national outreach learning programme, which engages hundreds of thousands of people each year, inspiring them to grow and value UK native plant species and create homes for pollinators. Grow Wild's website includes information about pollinators and a [quiz](#) to test people's knowledge and its Instagram account (9.8k followers) includes a story section on pollinators.
- Teacher Training and Continuing Professional Development.
- Community and Access Learning programmes.
- Family and Early Years programmes - including family trails, spotter sheets and Bioblitz activities.
- Guided tours in the gardens.
- Youth Programmes: Earthwise – Kew's summer programme – introduces young people to the process of scientific inquiry in Kew's natural area investigating questions such as 'How do common insect groups vary across habitats?'

18 July 2023

References

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