

UCIL 20411 Creating a Sustainable World

Biodiversity Conservation at the University of Manchester: Monitoring Pollinators

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Daniel Catley

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Executive Summary

Pollinator numbers in the UK are declining. Without them the country simply would not be able to produce sufficient crops to feed everyone, Bees alone are responsible for an estimated £650 to £700 million for the economy (Knapton, 2015). With the constant expansion of cities into previously rural land the insects that play such a vital role in the production of crops are being forced into urban areas. While this expansion is one of the causes for pollinator decline cities may be able to offer some novel ways to adapt to this need to preserve such important creatures. Rooftop gardens and green corridors may be the way forward for cities that wish to grow sustainably. With an emphasis on utilising all the space that is available, many initiatives are looking at how urban environments can be made more suitable for pollinating insects. The University of Manchester have set out a number of Environmental Sustainability objectives including a target to monitor pollinators and assess the species and total populations around the campus. As part of their biodiversity conservation project I have researched the viability of the campus as a habitat for these pollinators and what changes might be made to help monitor them.

Introduction

Pollinators play an essential role in the production of food crops worldwide, without them humanity would be unable to maintain the diets that we currently enjoy. While rural and suburban areas are homogenised through expanding use of pesticides and livestock farms insect pollinators are being driven away from their traditional habitats and into urban environments.

The University of Manchester want to study what pollinators are doing on campus and how they are coping with this type of unnatural environment. From large green spaces such as Whitworth Park to rooftop gardens and flowering plants added to verges around campus it is clear that the University is trying to give back some more natural space to the species that have moved in.

In my research I have looked at the effects of declining natural land on native insect pollinators and how this is making them an important consideration to take into account in urban development. I have reviewed the feasibility of introducing new species and the possible changes that could be made around the campus in order to facilitate healthier pollinator populations.

The Importance of Pollinators

The populations of UK native pollinating insects are in decline, a 2019 study which took data on bee and hoverfly occupancy throughout Great Britain over a period of 33 years, from 1980 to 2013 (Powney et al. 2019). Using modern Bayesian data modelling techniques to essentially fill in the gaps in the previously incomplete sampling data researchers were able to build a mostly complete representation of the trends of bee and hoverfly populations over a large period of time. The study found that the declines in both sets of insect populations reached around 25%. Fig. 1 shows data collected by the JNCC that backs up the claims that occupancy has been decreasing for several decades and goes further to show a decreasing short term trend in pollinator species between 2011 and 2016.

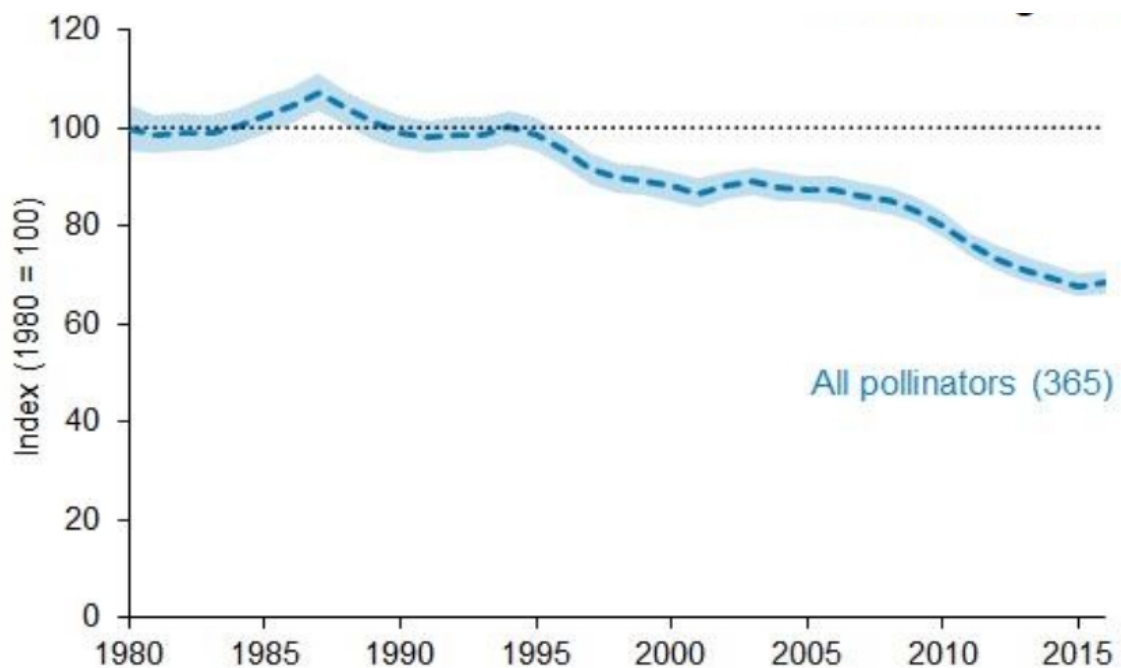


Fig.1: Change in the distribution of UK pollinators (JNCC, 2019)

This is a huge problem for agriculture where these species are vital to the growth of food crops. If such a trend in pollinator numbers continues then UK will become even less self-sufficient and a reduction in exported crops is likely to result in lost jobs and increased prices for imported food (Global Food Security, 2019). There are several factors that are suspected to be the cause of this decline. Firstly, a transition from traditional agricultural lands to monoculture or indoor livestock operations is making some places inhospitable to pollinators (Hall et al., 2016). Other causes believed to be linked to lower occupancy include the expansive use of pesticides and the effects of global warming. It is suggested that the less predictable seasons we are experiencing may cause pollinators to fall out of step with the times that the flowering plants that they forage on. Unfortunately these patterns of unpredictability are only expected to worsen as the effects of climate change continue to exacerbate extreme weather conditions in the UK and around the world. This therefore is a multi-faceted sustainability issue where the effects of declining pollinator numbers will have far reaching consequences for people in terms of their access to food, income security and for the health of thousands of other species that rely on them for their role in many ecosystems.

Insect Pollinators in Urban Environments

In spite of the generally accepted trend of decreasing pollinator numbers with increasing urbanisation, evidence has been seen that would suggest that urban environments can host remarkably high pollinator species richness (Baldock et al. 2015). As the proportion of people living in urban areas grows and cities expand further into the habitats of bees and insects it is important to look at how this environmental change is affecting them and how best to safeguard their existence in these unnatural places.

Providing Quality Habitats for Urban Pollinators

Green roofs are one of the ways in which many cities are aiming to provide places for those species that have been displaced by expanding urbanisation. The biodiversity benefits of green rooftops are dependent on a number of factors such as the variety of plants, proximity to other green spaces or corridors and the total surface area of the vegetation (Red Rose Forest, 2014) however there is an understanding that these urban areas do tend to harbor greater species diversity than equivalent areas of rural land (Baldock, et al., 2015).

University Initiatives for Biodiversity on Campus

As part of 'The Living Campus Plan' the University of Manchester has already set out a number of goals to bolster environmental sustainability around the main campus buildings and these include targets for greater invertebrate numbers and invertebrate diversity (The University of Manchester, 2014). This plan could offer a good starting point for further projects that seek to directly affect change in the roles of pollinators on campus.

One of the other key activities outlined in the delivery section of the plan is the promotion of biodiversity-related community projects. This has been implemented to some extent through the use of student volunteers working alongside members of local communities who take part in maintaining green areas as part of the Sustainability Challenge.

While these initiatives offer something of a foundation for developing the University's environmental sustainability they are lacking in some key details.

For accurate information regarding the correlation between the work that is being done already and improvement in biodiversity the data being tracked should be expanded in order to capture the occupancy and specific species of pollinators on campus.

Introducing New Pollinators to Urban Areas

A straight-forward response to low pollinator occupancy might be to introduce more pollinators artificially. Urban beekeeping is one increasingly common way that cities are bolstering their numbers. These managed bees are beneficial in areas where gardens and green spaces can provide abundant nectar however they also have the potential to negatively impact biodiversity under conditions which are more common in urban areas.

Findings

Species and Pollinator Occupancy on Campus

In the UK most pollination is carried out by bees, hoverflies, wasps, moths, beetles and butterflies (DEFRA, 2014). As urbanisation has spread cities into previously natural land these pollinators have moved into more urban environments. There is little to no data found while researching on the exact species or numbers of pollinators specific to the campus. It therefore has been assumed that those that are present are similar to those found in studies conducted in other urban settings within the UK (with the exception of those that are categorised as managed species and are known to be present as part of ongoing projects in the area).

Positive Effects of Implementing Pollinators on Campus

While green rooftops might be key to providing flower-rich areas for pollinators to visit in the city it is not the only way that these spaces can be used to support healthy species populations. Several rooftops around the campus are already host to beehives including on top of the Rutherford Building, The Whitworth and at Jodrell Bank (The University of Manchester, 2014). These hives are each home to between 20,000 and 80,000 honey bees.

The benefits of introducing pollinators to the campus are numerous. Apiaries and beehives, such as those around the campus already, tend to produce healthier and more productive bees than those in rural areas (Smart Cities Dive). Due to being removed from agriculture and farmland these bees are less exposed to harmful pesticides. Combined with the typically warmer climate in urban areas allowing them to more often survive and remain active in the winter months, these bees can be active producers of honey for much longer and at lower cost to their keepers. This is be a benefit to the area econmically as local producers have a greater yield and can sell more of their product. These managed beehives can also help to monitor trends in pollinator health in the area as their numbers are more easily observed. They can also provide useful data to further studies in urban pollinator behaviour and interactions with the University's biodiversity projects.

Potential Negative Effects of Implementing Pollinators on Campus

When introducing new pollinators, in particular social bees like honey bees, there is a risk that they will upset the existing plant-pollinator interactions. This problem arises when invasive species reach extremely high densities or displace the native species typically pollinating native plants (Morales, et al., 2017). The risk of displacing native species is greater in urban areas due to the comparative scarcity of plants, it is therefore essential that they are monitored closely and their introduction kept to a minimum when possible.

Non-native pollinators do not always have a negative impact, provided that that there are mixed native and invasive plants available to them however this is most often not the case and makes keeping undesirable plants avialable that could have adverse and unexpected effects on native flora.

Creating Green Infrastructure

The most viable and easily implemented way that the University might make the campus a more hospitable environment for insect pollinators is by building green corridors. Utilising space efficiently is key to creating such corridors which would connect larger green spaces, such as Whitworth Park, to areas further into the city. By expanding the utilisation of verges and other small green areas to grow flowering plants the areas that would be shared by

pollinators would become greater, allowing for higher numbers to co-exist. This could be a simple task given the amount of amenity grasses around the university buildings that could be made suitable for supporting various bee and hoverfly species with a few inexpensive changes.

Areas such as Brunswick Park and the Alan Guilbert Learning Commons are ideal locations for the University to look at implementing their plans to improve biodiversity. By diversifying the plant species around the campus to include more that are nectar and pollen rich and planting them in groups that are capable of flowering year-round, the areas around Oxford Road could become a haven for the city's pollinators.

In a study carried out by the University of Bristol that assessed urban land use for pollinators, it was found that allotments growing lavender, borage, dandelions, thistles, brambles and buttercups were important for promoting healthy pollinators within cities (University of Bristol, 2019). These plant species are cheap, easy to grow and would provide sustenance for a healthy pollinator occupancy in the heart of the campus.

Several campus buildings are ideal candidates for building rooftop gardens on. As outlined in the Green Wall - Green Roof document 3 such buildings have been identified as appropriate places for these gardens; the IT building, the Students' Union and the Humanities Bridgeford Street building. At an estimated £100 to £140 per square meter these would be much more expensive than developing ground level gardens. Space is at a premium on the campus with new expansions planned all the time, it therefore could very much be worth the additional expense to turn more campus rooftops into gardens.

In addition to improving biodiversity, other benefits of turning the campus into a green corridor is that it will also help to address several of the University's environmental sustainability objectives such as improved air quality along Oxford Road and reducing CO2 emissions.

Conclusions

Pollinators play several important roles in the modern city and can offer economic benefits to those that help to cultivate healthy spaces for them.

There is currently a lack of use of green areas around the University campus that could be made to better serve the purpose of battling the declining populations of bees and hoverflies by simply using the available land more effectively.

Recommendations

As of 2014/15 the Living Campus Plan has seen some initial work in identifying and quantifying green spaces to be set alongside some data of green wall coverage and targets to be reached by 2022. These targets, however are somewhat vague and could benefit from more clearly defined metrics to define successful development.

The addition of more rooftop gardens would help to improve occupancy around the campus without having to make new space in an already crowded area.

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