Better-B newsletter

Issue n°2 – October 2024

***Embracing harmony and balance**, within honey bee colonies as well as their environment provides a solid foundation for **resilient beekeeping**. One aspect Better-B is addressing through its research activities is the availability of floral resources (e.g., pollen and nectar) for bees and other pollinators. We are collecting data on flowering plants and visits by insects as part of the Better-B Food Sharing Study, run in collaboration with the Danish Beekeepers Association. This is a citizen science study where observations are submitted through the Beeplants.eu web portal.*

Learning by observing

Pollinator ecology

Learning by observing is fun. Especially when you're observing pollinating insects at work. That's exactly what Better-B is aiming to do as part of its work to better understand the carrying capacity of pollinators in European landscapes. To make learning more fun, we've launched a citizen science study, where anyone can contribute by submitting their observations and sharing the results. Around 250 citizen scientists are already taking part, and we're inviting the rest of Europe's beekeepers to join us next season, in 2025. In this newsletter, we explain why we launched this citizen science study, how it is being conducted and how people can get involved.

Why a food sharing study?

As a result of the increasing impact of urbanization, climate change, agriculture, industrialization, infrastructure, and industrial activities, food sources for bees and other insects (pollinating insects), are negatively impacted. Fewer flowering plants consequently means scarcer floral resources. With more bees, as well as other pollinators (e.g., hoverflies and butterflies), visiting the remaining plants this means this limited floral resource needs to be shared. Here we come to a sensitive point: does food sharing lead to competition amongst pollinating insects? We simply do not know, because the number and diversity of pollinating insects on flowers depends not only on the availability of flowers, but also on nesting opportunities, different foraging periods, whether they live in colonies or are solitary, and different periods of hibernation/activity. Most of these factors are temporally and spatial/locally determined. Collecting data on the pollinators that visit plants will provide the scientific knowledge, the 'building blocks', to determine whether something is happening and, if so, what is happening and how it can be mitigated.

Figure 1: Floral resources in an agricultural field. Image by L. Hansted

How will we learn?

We will learn from the observations and recordings of hundreds of people who are actively participating in our study as citizen scientists. We are asking registered citizen scientists to record insects on the same plots of flowers in the same places at least twice a week. This can easily be done in the garden, near their apiary or, for example, during lunchtime walks. We want these observations to be as simple and easy as possible. All we ask is that citizen scientists record honey bees, solitary bees, bumblebees, hoverflies and other insects on their selected patch(s) of flowers or part of a tree, which can be seen at a glance in about a minute. One minute's work, it's that simple!

Observing '*no*' insects is also very useful. This may be due to bad weather or simply to the fact that no insects visited the plot at the time of the one-minute observation. By analysing repeated observations of the same flower plot, we can highlight the impact of time, weather conditions, date, observation period and land use (EU land use data) at that particular location. This helps us to understand the extent to which local conditions are favourable to all pollinating insects, including bees.

Nesting and foraging distance

To explain the importance of nesting sites, let's take a few examples. An environment with lots of flowers but few or no nesting opportunities, or solitary bees nesting on the ground (for example, due to ploughing) will result in records without those solitary bees that could potentially be found there. The same applies to honey bees, bumble bees, hoverflies and other pollinating insects such as butterflies. The distance between where pollinating insects live and where they forage is important. For example, the foraging distance of solitary bees and hoverflies is expressed in metres, with a maximum of hundreds of metres. The radius of action of bumblebees and honey bees is expressed in kilometres, with an average of 1 to 1.5 kilometres. Bumblebees (which also nest on the ground) can fly much further than solitary bees from their nesting sites to their favourite floral resources.

Mass flowering and foraging strategies

Another important aspect to note is the foraging strategy of pollinating insects. For example, the honey bee colony concentrates on mass flowering, staying on the same flower species during a foraging flight, and using the 'waving dance' to communicate the right locations. Other pollinating insects, such as bumblebees and solitary bees, do not have this dance communication strategy. Bumblebees collect their food from all honey plants, with a preference for pollen with a high amino acid content. Generalists among solitary bees collect food from all bee plants, while specialists restrict themselves to specific plants, ranging from family specialists to species specialists. All of this must be available within the very restricted flight radius of solitary bees, which can be as little as a few hundred metres.

Groundbreaking study

The Better-B Food Sharing Study will be the first comprehensive scientific study of the sharing of food sources by insect pollinators. No comprehensive information is currently available. There are only studies in which knowledge of the sharing of food sources is an indirect result of the actual objective of the study, for example studies focusing on the exchange of parasites on mutual food sources, studies on the impact of apiaries on bumblebee colonies and studies on the extreme conditions in which large numbers of honey bees are found in a poor area after the end of a mass agricultural bloom.

Being a citizen scientist

Citizen Science is based on two pillars: involvement and simplicity.

We are primarily targeting beekeepers to become Better-B citizen scientists, as we believe they have the passion, curiosity and interest to become actively involved. Floral resources (such as pollen) are an essential source of protein for their bees and other pollinators. Their contributions have the power to advance pollinator research and help answer key questions about how insect pollinators share food sources. However, anyone can make a contribution by registering as a Better-B citizen scientist.

Once someone has registered as a Better-B citizen scientist, there's an opportunity to get in touch with project partners by joining an online AskMeAnything (AMA) session. These events occur online every month from March till November and any questions can be asked about the beeplants.eu website. All Better-B citizen scientists are welcome to join the AMA. In addition, people can opt to get regular updates via newsletters.

Our interpretation of the term 'simplicity' is that people only need a mobile phone to use the *Beeplants.eu* application. Basically, a Better-B citizen scientists can select the plant on the website they are observing, then record on the website the number of honey bees, bumblebees, solitary bees, hoverflies, and other insects seen in one glance, and submit the data. Time and location are recorded, by default. To find out more and become a Better-B citizen scientist visit the Better-B website.

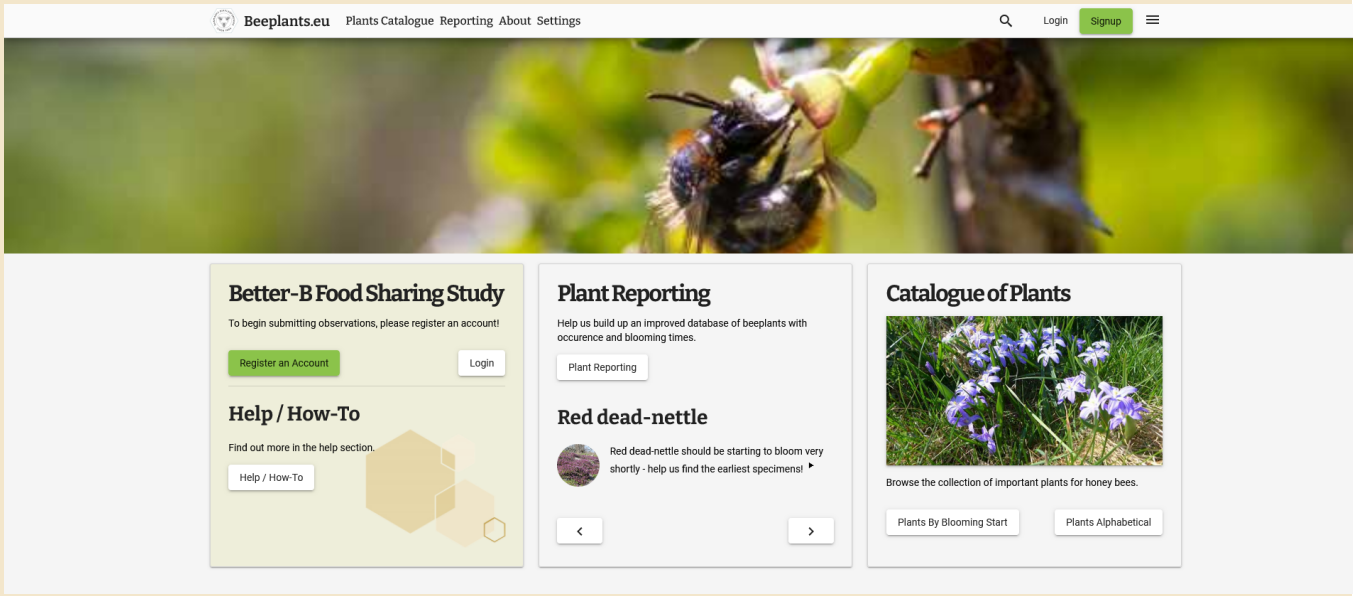

Figure 2: Screen shot of www.beeplants.eu home page. The website www.beeplants.eu is owned by the Danish Beekeepers Association (DBF), who are part of the Better-B project and are collaborating on the citizen science Food Sharing Study. On this website 'bee friendly plants' have been identified from the sites plant catalogue. Better-B citizen scientists can then record the pollinating insects they see on these plants. The catalogue is open for every plant on which pollinating insects are found. In addition, at the bottom of the website is a box called "Add a plant" for plants not already listed. To find out more and become a Better-B citizen scientist visit the Better-B website.

Only the number of pollinators counts! We are not asking which species of bumblebee is being observed (there are 65 different species in Europe), but simply the number of bumblebees, all species combined. Like bumblebees, there are hundreds of solitary bees, and often only specialists can tell which bee is being seen. So, as with bumblebees, we simply ask for the number of solitary bees on the patch of flowers observed. The same applies to hoverflies. Honey bees, solitary bees and hoverflies can look very similar. That's why we've developed a simple protocol, available on the website, that helps people correctly identify what they see within the different pollinator groups. It shows the general characteristics of bumblebees, solitary bees and hoverflies.

Data analysis

Once Better-B citizen scientists have entered their observations, all their data is available on their account, in both list and map form. In this way, each citizen scientist creates their own catalogue of melliferous plants, recording all the plants and pollinating insects they have seen. Each year, the data will be analysed solely for research purposes by the University of Aarhus (DK). The website and data analyses comply with the European Data Protection Regulation (GDPR). No personal data other than e-mail address is requested, simply to keep in touch. The observation sites are located by GPS by default and are not linked to an address.

Our aim is to obtain thousands of data entries and the database is growing. Between March and September 2024, 7100 recordings were made by 225 citizen scientists in Finland, Latvia, Norway, Denmark, the Netherlands, Belgium and France. Citizen scientists from Germany, Ireland and Switzerland also took part and contributed to the recordings. Next year, we will be extending the call for citizen scientists to Ireland, Spain, Portugal, Italy, Greece and Germany.

What have we learnt so far

A few personal anecdotes to round off this newsletter to illustrate learning through observation: We have many dandelion, sunflower, dahlia, marjoram and mint flowers in our garden. Dandelions, sunflowers and dahlias belong to the Asteraceae family and have different flowering periods. During my observations, I saw many honey bees foraging on the dandelion, many hoverflies and solitary bees, and almost no honey bees on the sunflowers and dahlias, whereas on the marjoram (*Origanum spp.*), I only saw honey bees. The mint attracted the beewolf (*Philanthus triangulum*), which happily surprised me.

J. van der Steen (Better-B partner and beekeeper)

Get Involved

Anyone can contribute to this study by registering as a Better-B citizen scientist. For more information people can visit the Better-B website or register at beeplants.eu. Currently, the website is available in English, Danish, Dutch, Latvian, French, and Norwegian. The aim is to create a European-wide coverage, with additional languages added.

Join us for our upcoming public event, half a day of project updates and open forum discussions about Darwinian selection, the bee plant catalogue, and hive designs for thermoregulation. This will be a hybrid event (in person and online) in Wageningen, the Netherlands on Thursday 14 Nov 2024, right after the COLOSS conference (11-13 Nov 2024).

Learn more
www.better-b.eu

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Better-B Project

This work was supported by the Better-B project, which has received funding from the European Union, the Swiss State Secretariat for Education, Research and Innovation (SERI) and UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee (grant number 10068544).