BeeLife
European Beekeeping Coordination

THE BEE HUB
Developing an Integrative Platform for Pollinator Health Data

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Bees and other insect pollinators are taking more and more relevance in the public debate. European authorities now recognise the environmental risks that pollinators face and the need for institutional action. Given their importance for ecosystems and their role in our food security, the commitment to protect pollinators has been continuously increasing. Data is essential to fulfilling this commitment, thus motivating BeeLife to improve the required tools to understand and counter the risks for pollinators. To help advance these efforts, BeeLife has initiated the development of The Bee Hub, an integrative platform to centralise and communicate pollinator-related data. The Bee Hub aims at gathering data, processing it and making it available to the public so that agents can further develop beneficial measures for pollinators and make timely decisions. Thanks to a network of field practitioners, researchers and data scientists, as well as the support of the EU Bee Partnership, the development of a Bee Hub Proof of Concept (PoC) has now finalised.

The challenges for bees in Europe and the world are widely recognised and have been an increasing priority by several institutional actors. For instance, the previous president of the European Commission, Jean Claude Juncker, made headlines a couple of years ago by claiming "I'm the bees' man", and insisting on the need to protect them [1]. However, actual protection requires more than just political will. It requires the necessary tools to monitor and collect the data needed to assess and plan which measures to take. Fortunately, beekeepers, associations, researchers, and public authorities are upping the efforts to understand bees, pollinators in general and their environmental challenges. Thanks to their ongoing collaborations, new opportunities to help pollinators continue to arise. One of them is the integration of bee-health data from different sources. In line with this opportunity for integration, BeeLife European Beekeeping Coordination has succeeded in creating the Proof of Concept of an integration tool for pollinator-related data named the Bee Hub.

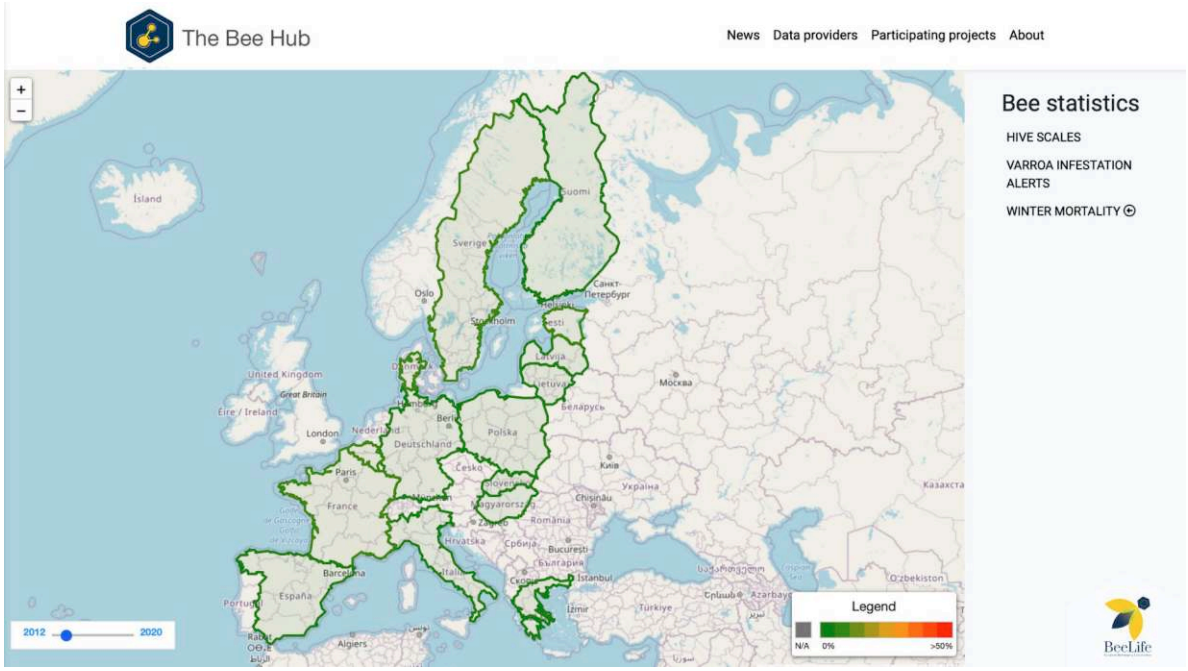

Figure 1. Bee Hub Proof of Concept - September 2020

The current Bee Hub PoC integrates three different sources of data that include:

- Hive scale measurements - Network of scales throughout Belgium coordinated by the Apicultural Centre for Research and Information [2];
- Honeybee colony winter mortality - Epilobee analysis [3] project and COLOSS Prevention of honeybee colony losses [4];
- Varroa infestation alerts - Biene Österreich [5].

After the successful experience with the PoC, next steps will include a new phase of prototype development. It will involve the integration of new sources of data and further stimulating collaborations with stakeholders.

Roots and objectives

Thanks to the dynamisation of the European Food Safety Authority (EFSA), the EU Bee Partnership, was officially established in 2018 [6]. A discussion group for stakeholder engagement, it is composed of representatives from the beekeeping and farming sectors, NGOs, public agencies, veterinarians, academia, industry, producers, and scientists. BeeLife, as a registered stakeholder, is working to materialise an essential conclusion from the partnership: the need for data integration and communication.

Attempting to create a solution for the needs identified by the EU Bee Partnership, BeeLife is leading the development of The Bee Hub. In the frame of the fast-track-to-innovation project, the Internet of Bees [7], which applied new technological developments to monitoring bee health, BeeLife took the initial steps to create this platform by successfully creating a functional Proof of Concept of the Bee Hub.

In general guidelines, the goal is to create a European (and potentially worldwide) platform that includes any relevant data linked to pollinators. The objective is to build a communicative tool on the status of pollinators and pollination, both essential for food security and biodiversity [8]. The development of this platform intends to provide a user-friendly window on the state of pollinators in real-time, identifying problematic and harmless areas. The aim is to improve our understanding of challenges that pollinators face through improved data communication, benefiting scientific research and creating added value by supporting decision-making.

Integrating data and taking part in the development of a BeeXML standard

Currently, there are multiple sources for bee health data. There are initially five identifiable sources that, in some cases, collaborate between them:

- Producers of beehive monitoring systems:
  These may involve different technologies and different measurements. The most popular ones are hive-scales, which register hive weight and weather forecast. Nevertheless, other monitoring systems may include parameters such as humidity, in-hive temperature, acoustic measurement, bee-traffic count, etc.
- Academic research.
- Government institutions.
- Individual beekeepers.
- Beekeeping associations.

All of these actors do not, however, collect or express their data in a unified model. Each has its own practices for data collection and storage. Although some may envisage collaborations and data sharing, they do not yet do so in a standardised method. Besides, until now, no platform integrates this data to make it available to the public. Although different stakeholders continuously collect valuable information on bee health, there is still a missing ingredient to reach a new level of awareness on the condition of pollinators and their challenges. The integration of data from different sources is the first test to surmount. The Bee Hub comes as a collaborative platform in which each data provider is recognised and helps in its shaping.

Although the Bee Hub is a new effort to integrate and communicate data, it does not come as a completely new tool. It also works in parallel to other initiatives. The Apimondia Working Group on the standardisation of data on bees and beekeeping is an outstanding

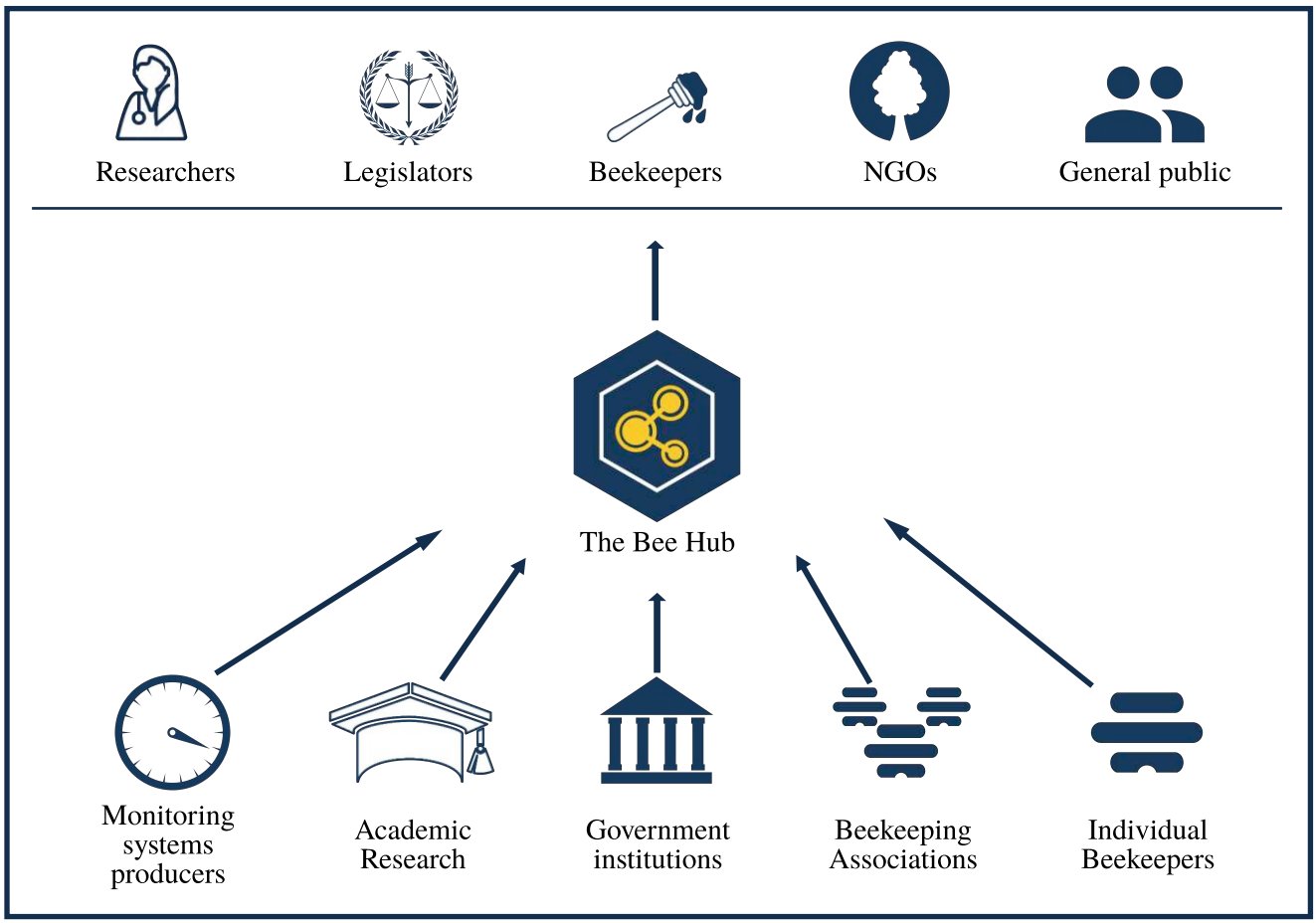

Figure 2. Data flow for The Bee Hub.

example. This working group is looking at incentivising the development of best practices in relation to data acquisition and sharing. Based on the Extensible Markup Language (XML), a programming language for storing and transporting data, BeeXML is the ongoing initiative to reach a new model for sharing bee data [9].

Another objective of the Bee Hub is to be a driver for the implementation of BeeXML. Through agreements with several data sources and having a direct communications channel with providers, the Bee Hub is expected to serve as a collaborative exercise. It will simultaneously develop the platform and the best practices for data sharing, taking part in the shaping of the BeeXML.

Data ownership and privacy

One of the main difficulties for creating an integrative platform for bee health is data ownership and privacy. Nevertheless, as a non-profit initiative, open to the public, the Bee Hub looks to ensure the trust of its collaborators. It does not claim any ownership of data, and it strives to protect its owners through a comprehensive data-sharing agreement.

The main principle on which the Bee Hub stands is that the producers of data are and remain to be the sole owners of the data. They decide if and to what extent the data is shared within the repository and with the general public.

In the case of data coming from beehive monitoring systems, for example, the owners are not the company providing monitoring services, but the owners of the equipment. In the case of beekeeping associations installing monitoring systems throughout its network, it is the association the owner of data. In this case, sharing data depends on a direct agreement with the association, who decides the level of publicity of their data.

Considering the nature of the Bee Hub, any incoming data or even further contributions are fully credited. This identification allows end-users to know the sources of data and further promote collaborations. Published relevant information includes (if the data is made public) the logo of the company or organisation, project, full name, description, contact and any additional details that may be requested by the data provider.

Another critical challenge is the privacy of beekeepers who provide their data. To tackle this challenge, data is anonymised in two stages to protect sensitive information of beekeepers. First, at the source, meaning that the Bee Hub receives data with no identifiable personal information. Second, at the importation stage. For instance, geolocalisation does not include full coordinates, so that it only provides a vague approximate location. Therefore, end-users will be able to have the necessary information, without a need for concern of privacy on the beekeeper's side.

Conclusion

The Bee Hub is currently developing as an ongoing process to better collect and share pollinator-related data. Environmental challenges increasingly demand that our strategies to monitor the health pollinators are improved. The objective is to develop a comprehensive platform able to integrate not only data but the know-how of pollinator health data stakeholders. Through constant collaborations, this platform could be able to provide an integrative tool for beekeepers, associations, researchers, government and policymakers.

After a successful development of a Proof of Concept, work on the Bee Hub will continue. The next step is the development of a prototype, a process during which collaborations and partnerships will continue to grow. The Bee Hub is a new venture to convert data into relevant information for the future of pollinators.

References:

[1] Marks, S. & Paravicini, J. 2017. *I'm the bees' man: Juncker on Article 50 day*. https://www.politico.eu/article/im-the-bees-man-juncker-on-article-50-day/

[2] Centre apicole de recherche et d'information (CARI). Balances. http://www.cari.be/balances/

[3] Epilobee Study on honeybee colony losses. *https://ec.europa.eu/food/animals/live_animals/bees/study_on_mortality_en*

[4] COLOSS Honeybee Research Association. https://coloss.org

[5] Biene Österreich. https://www.biene-oesterreich.at

[6] EFSA. 2018. *Terms of Reference for the EU Bee Partnership.* http://www.efsa.europa.eu/en/supporting/pub/en-1423

[7] The Internet of Bees. http://io-bee.eu

[8] IPBES. 2019. *The IPBES' 2019 Global Assessment Report on Biodiversity and Ecosystem Services.* https://ipbes.net/global-assessment-report-biodiversity-ecosystem-services

[9] Apimondia Bee XML Working Group http://beexml.org

For more information on the Bee Hub and possible collaborations:

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About BeeLife European Beekeeping Coordination:

BeeLife is an NGO initially formed by professionals of the beekeeping sector from different countries of the European Union. BeeLife works for the protection of pollinators in Europe, highlighting their value for nature and people. With over 20 members (beekeeping and farming associations) from 9 different European countries, BeeLife links policy, science and field observations to promote a more sustainable future for pollinators and their role in ecosystems.

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