Busy Bees in Search of Data: OCELI Project Makes Causes of Bee Mortality Measurable

The aim of the OCELI research project is to use artificial intelligence to collect precise and continuously reliable data on the causes of the decline in bee and bumblebee populations for the first time. As part of the project, five partners under the consortium leadership of the FZI Research Center for Information Technology are developing a technology for the protection of bees and bumblebees in the agricultural landscape.

Karlsruhe, 21.02.2022 – There are many reasons why bee and bumblebee populations are declining in Germany and worldwide: In addition to the use of pesticides, monocultures, pathogens or destroyed habitat are only some reasons. The species extinction crisis is just as important as the climate crisis, said German Environment Minister Steffi Lemke recently. One thing is certain: Insect extinction is a major problem of our time. A consortium from science and industry now wants to develop a basis for answers to the question "How can the extinction be stopped?" in the OCELI research project. In the past, there have been national and international efforts to halt the decline in biodiversity. The fact that these have not been successful is primarily due to considerable gaps in knowledge: Although many of the causes of species loss are known, knowledge about the complex interaction of these factors is incomplete. The project partners apic.ai, Eurofins Agroscience Services Ecotox, Disy Informationssysteme GmbH and the Helmholtz Centre for Environmental Research - UFZ now want to develop the technological basis with the FZI to close existing knowledge gaps. Together, they want to research which stressors exist for bee and bumblebee colonies and how they are related. Among other things, competencies from applied artificial intelligence and sensor technology will be used. These will enable the consortium to precisely measure the effects of the design of agriculturally used areas on pollinators for the first time and to systematically collect data over long periods of time.

Christoph Zimmermann, department manager at the FZI, explains: "We want to track the effects of measures in real time to protect pollinators. We get support from the honeybees and bumblebees themselves. Their feedback enables us to generate a reliable database for the first time so that targeted measures for insect-friendly agriculture can be developed."

Data to close knowledge gaps

To collect the data, connected camera systems will be installed at the entrance of beehives or bumblebee colonies this spring, continuously filming all incoming and outgoing animals. Here, apic.ai contributes its expertise in the field of visual, local monitoring technology for pollinators. Neural networks are used to acquire and process the recorded activities. The FZI is responsible for the development of the feature extraction algorithms. The evaluation takes place at the UFZ by means of the simulation models BEEHAVE and Bumble-BEEHAVE and should provide information

about the hazards and interactions. In addition, the analysis of geo, weather, land use and flight monitoring data will establish causal relationships between changes in the environment of the bee colonies and their development. In doing so, Disy analyzes observational monitoring results. Accompanying field studies, carried out by Eurofins as part of the project, can be used to test hypotheses about specific causes of insect mortality. Based on these data, it should be possible to develop best practices and effective measures for pollinator-friendly agriculture in the future. For example, the technology developed in the research project can be used to find out which types of pesticides are critical or even non-critical for pollinators and whether the abundance and diversity of local flowering plants allow pollinators to live well. In addition, the success of specific measures to protect pollinators will be measurable.

The OCELI research project is part of the collaborative project "Bee-based biomonitoring to unlock the synergetic mechanisms of agriculture and pollinator insects". It is funded by the German Federal Ministry of Food and Agriculture with more than 1.3 million Euros until 06.06.2024. More information about the research project can be found here: http://oceli.de

About the FZI Research Center for Information Technology

The FZI Research Center for Information Technology, with its main office in Karlsruhe and a branch office in Berlin, is a non-profit institution for applied research in information technology and technology transfer. Its task is to provide businesses and public institutions with the latest research findings in information technology. It also qualifies young researchers for their career in academics or business as well as self-employment. Together with professors from different faculties, research teams at the FZI interdisciplinarily develop and prototype concepts, software, hardware and system solutions for their clients. The FZI House of Living Labs offers a unique research environment for applied research. The FZI is the innovation partner of the Karlsruhe Institute of Technology (KIT).

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