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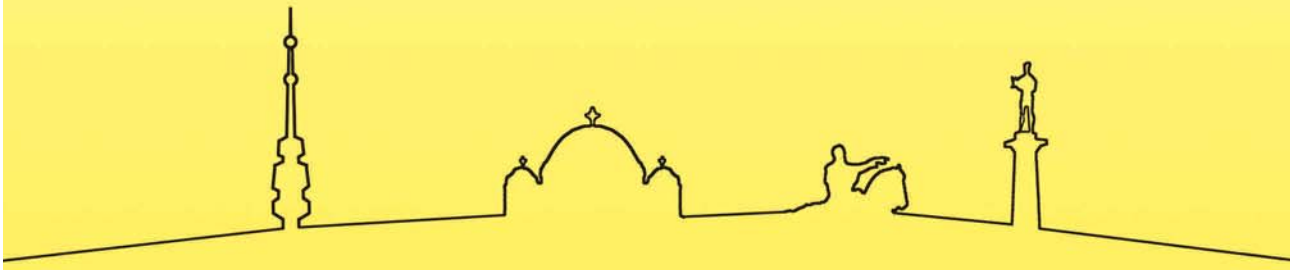

BIO-MONITORING OF ENVIRONMENTAL POLLUTION USING THE CITIZEN SCIENCE APPROACH

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Honeybee colonies are excellent bio-samplers of biological material such as nectar, pollen, and plant pathogens, as well as non-biological material such as pesticides or airborne contamination. The INSIGNIA-EU project aims to design and test an innovative, non-invasive, scientifically proven citizen science environmental monitoring protocol for the detection of pesticides, microplastics, heavy metals, and air pollutants by honey bee colonies http://insignia-eu.eu. In the pilot INSIGNIA project (2018-2021), a protocol was developed and tested for citizen-science-based monitoring of pesticides using honeybees. As part of the project, biweekly pollen was obtained from sentinel apiaries over a range of European countries and landscapes and analysed for botanical origin, using state-of-the-art molecular techniques such as metabarcoding. An innovative non-biological matrix, the "APIStrip", was also proved to be very efficient for detecting the residues of 273 agricultural pesticides and veterinary products, both authorized and unauthorized. The data collected are used to develop and test a spatial modelling system aimed at predicting the spatially-explicit environmental fate of pesticides and honeybee landscape-scale pollen foraging, with a common underlying geo-database containing European land-use and land-cover data (CORINE), the LUCAS database (landcover) supplemented with national data sets on agricultural and (semi-) natural habitats.

After a call by the European Commission, a new 2 years project was granted aiming to present a comprehensive pan-European environmental pollution monitoring study with honey bees. Although pesticides used in agriculture, are a known hazard due to their biological activity, other pollutants, have even been recognized as such, for which we have not been aware of their impact for many years. An example is air pollution which increased while our societies industrialized and is currently regarded as the single largest environmental health risk in Europe (https://www.eea.europa.eu/). Unfortunately, other pollutants such as heavy metals, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, airborne particulate matter, and microplastics have also reached our environment. The outcome of this project will provide the first standardized EU-wide monitoring of all types of environmental pollutants with honey bee colonies. The project is funded by the EU, under the N° 09.200200/2021/864096/SER/ ENV.D.2 contract.

Key words: Bio-monitoring, citizen science, environmental pollutants