Institute: Institute of Nature Conservation Polish Academy of Sciences

Title: Impact of pesticides on insect pollinators: implications for environmental risk assessment (ERA)

Scientific discipline: Biological Sciences

Name of potential supervisor: Dr hab. Agnieszka Bednarska

Background information: The research topic carried out within the framework of the EU project PollinERA - "Understanding pesticide-pollinator interactions to support EU environmental risk assessment and policy" (HORIZON-RIA [No. 101135005]). PollinERA will move the evaluation of the risk and impacts of pesticides and suggestions for mitigation beyond the current situation of assessing single pesticides in isolation on honeybees to an ecologically consistent assessment of effects on insect pollinators using a systems approach. The research topic will include field and laboratory studies. Field monitoring study will identify and quantify pesticides in various pollinator species and pollinator-relevant matrices (pollen, nectar, water, plant matrices, soil) in different agricultural landscapes and crop types. In turn, laboratory experiments will test the distribution of pesticide sensitivity among different pollinator taxa (e.g., wild bees, hoverflies, butterflies, moths), as well as identify the main morphological, physiological, and ecological traits that could explain differences in pesticide sensitivity among species also in relationship with the different pesticide modes of action and exposure routes. In addition to testing the direct toxicity effects (lethal and sublethal) caused by a single pesticide, the sensitivity of selected pollinator species (adults and larvae) to mixtures of pesticides will be tested. Toxicokinetic experiments will also be conducted to support TKTD models and to develop standardized ecotoxicological tests for new pollinator species suitable in the risk assessment.

The doctoral scholarship will be funded by the project (ca. 6600 PLN gross monthly)

The main question to be addressed in the project:

- What are the primary sources and routes of exposure to pesticides of representatives of different pollinator groups?
- What are the effects of pesticides with different modes of action, applied singly and in a mixture, on the life history parameters and physiology of representatives of different pollinator groups after acute and chronic exposure?
- What is the relationship between the vulnerability of different species to pesticides and their physiological, morphological ecological traits?

Information on the methods/description of work: Methods will include field sampling (pollinator trapping, collection of pollen, nectar, plants, soil, water to verify their level of pesticide contamination) and laboratory studies (breeding of different species of pollinators, ecotoxicological tests on selected species, measurements of morphological and physiological characteristics of selected pollinator species, toxicokinetic experiments). Not only participation in field research and laboratory experiments is expected, but also in different types of business trips (conferences, internships, project meetings), data analysis, preparation of reports and publications in scientific journals, as well as presentation of the obtained results at conferences and seminars.

Additional information (e.g., special requirements from the candidate): Requirements from the candidate include knowledge of biology and ecology, experience in field (and good condition to work in field conditions) and/or laboratory work, general knowledge of insect biology and basic statistical methods, and good oral and written English. Knowledge of the Polish language (need to establish contacts with farmers) and a driving license will be additional assets considered.

Place/name of potential collaborator: The research will be conducted in close cooperation with Prof. Ryszard Laskowski from the Institute of Environmental Sciences at Jagiellonian University. In addition, cooperation will be carried out with other members of the PollinERA project, mostly from the University of Bologna in Italy (Dr. Fabio Sgolastra) and Lund University in Sweden (Dr. Maj Rundlöf).

References (max. 3):

Seibold, S., Gossner, M.M., Simons, N.K. et al. Arthropod decline in grasslands and forests is associated with landscape-level drivers. Nature 574, 671–674 (2019). https://doi.org/10.1038/s41586-019-1684-3

Knapp, J.L., Nicholson, C.C., Jonsson, O. et al. Ecological traits interact with landscape context to determine bees' pesticide risk. Nat Ecol Evol 7, 547–556 (2023). https://doi.org/10.1038/s41559-023-01990-5

Robinson A, Hesketh H, Lahive E, Horton AA, Svendsen C, Rortais A, Dorne JL, Baas J, Heard MS, Spurgeon DJ. 2017. Comparing bee species responses to chemical mixtures: Common response patterns? PloS One 12(6): e0176289. https://doi.org/10.1371/journal.pone.0176289

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*Jeżeli kandydat ma być doktorantem w projekcie finansowanym przez instytucje zewnętrzne należy wpisać dane o projekcie: numer, imię i nazwisko kierownika, nazwę i adres jednostki naukowej oraz informację: „Stypendium doktoranckie jest finansowane w ramach stypendium naukowego w projekcie".

* If the candidate is to be a doctoral student in a project funded by external institutions, it is necessary to enter data about the project: the number, the name of the head, the name and address of the Managing Unit and the information: "The doctoral fellowship is funded by a research fellowship in the project".