Institute of Environmental Sciences

**Topic:** Effect of agricultural practices and landscape structure on communities and species sensitivity distributions of ecosystem service providers

**Name of supervisor:** dr hab. Agnieszka Bednarska

 a.bednarska@uj.edu.pl

**Background information (max 200 words):**

Ecosystem service providers (ESP) constitute a large group of animals crucial for ecosystem functioning, such aspollinators and natural enemies of crop pests. Many pesticides used in agriculture and horticultureare not really selective against pests and affect also all other insects, including ESP. Indeed, in recent decades a dramatic decrease in abundance and biodiversity of ESP and other non-target arthropods (NTA) has been noted across the world. Although a number of studies already tried to address the problem, and more research programs are running at the moment, the questions on how to protect biodiversity of NTA in the agricultural landscape and to what extent the observed decline in numbers is caused by different, frequently overlapping, factors remain unanswered.

The proposed studies will be performed within a large international research project “EcoStack”.

**The main question to be addressed in the project (max 200 words):**

The study will focus on ESP communities to assess to what extent pesticides, intensification of other farming practices and landscape structure affect this group of invertebrates. The study will address two specific questions: (1) Do ESP communities differ in terms of abundance and diversity between areas with different crop system, pesticide use and landscape structure? (2) How the distribution of ESP sensitivity (SSD, species sensitivity distribution) towards insecticides is shaped by (a) pesticide use, (b) landscape structure, and (c) the community composition itself. Establishing SSDs for different ESP communities and different pesticides will also allow to estimate safe/acceptable levels of pesticide use.

**Information on the methods/description of work (max 200 words):**

ESPs will be collected in the field and screened for potential resistance to different insecticides that are commonly applied to crops in the region. Testing will be done both in the field and laboratory. The field tests will be done using coated glass vial assays based on IRAC (Insecticide Resistance Action Committee) Method 031. This method allows a large number of individuals, representing a range of ESP species, to be rapidly screened for sensitivity to insecticides. The curves will then be used to estimate (1) the predicted affected fraction (PAF) of ESPs within each landscape and for each tested chemical, (2) PAFs for other doses than actually used or recommended and(3) “safe” doses, such as a dose affecting not more than 5% species (HD5). The landscapes used for the studies will be described in detail using GIS methods, and all relevant information (crop system, pesticides use and other agricultural practices, etc.) will be collected from farmers. All this information will be used to analyse potential relationship between community structure and sensitivity distribution on the one hand and landscape structure and agricultural practices on the other.

**Additional information (e.g Special requirements from the student) (200 words):**

Driving licence, readiness for extensive field work, familiarity with GIS and statistical methods, general knowledge on ecotoxicology and pesticides.

**Place/name of potential foreign collaborator:**

Prof. José Paulo Sousa

Departament of Life Sciences

Lg. Marquês de Pombal

3004-517 Coimbra

Portugal

**References (3):**

<http://www.ecostack-h2020.eu/>

Potts SG, Biesmeijer JC, Kremen C et al.(2010) Global pollinator declines:trends, impacts and drivers. Trends EcolEvol 25: 345-353.

Senapathi D, Goddard MA, Kunin WE et al.(2017) Landscape impacts on pollinator communities in temperate systems: evidence and knowledge gaps. FunctEcol31: 26-37.