Description for the general public

Modern agriculture has become one of the most important threats to global biodiversity. Species richness and population sizes of the so-called non-target arthropods (NTA), i.e. those arthropods which are not the target of agricultural activities aimed at pest control, have decreased dramatically in areas used for intensive agriculture all over the world. The most endangered are the arthropods of meadows and agricultural fields, including carnivorous ground beetles, ladybirds, spiders and many pollinators such as bees, bumblebees, butterflies, etc. In the last few decades the decrease in abundance of these groups reached several dozen percent in some European countries. In Europe, many species that were very common not long ago – in 1970s or so, have become rare or very rare; some are now at the brink of extinction. At the same time, we have many good reasons to protect the biodiversity. Besides the arguments of moral (humans should not bring other species to extinction) and aesthetic (most of us are happy to see some manifestations of high biodiversity – e.g., colourful butterflies) background, there are also important economic reasons for maintaining high biodiversity. Without pollinators many plants will stop producing fruits, what in extreme events can bring famine, at least on a local scale, and in more moderate cases will lead to dramatic increases in food production costs, and in result – in food prices. In turn, the extinction of carnivorous beetles and spiders releases pests from natural control by their enemies, meaning the increased use of pesticides and, in consequence, also the increased food prices and, additionally, environmental pollution. All these arguments (and there are more) clearly show that protecting NTA diversity is very much our own business, and the current unprecedented decrease in biodiversity needs fast action. This is, unfortunately, hampered by the lack of good understanding of processes that govern species diversity and the abundance of NTA in agricultural landscapes. Nevertheless, the existing data point rather clearly on two main reasons of this highly undesired process: the widespread use of insecticides and changes in land use from small-scale family farming towards large-scale industrial agriculture.

The main aim of our research project is to construct mathematical models, based on solid data from field and laboratory studies, which will allow for assessment of the relative importance of these two main factors and for answering if it is possible to implement such spatial management practices that would allow for maintaining high agricultural productivity, even with the use of pesticides, promoting at the same time the diversity and abundance of NTA. The models constructed within the proposed research for two representative NTA species – the red mason bee (*Osmia rufa*) and the carabid beetle (*Bembidion lampros*) will be used to test a range of scenarios of pesticide use in different agricultural landscapes. This will let us to elaborate agricultural strategies optimal from the point of view of maintaining both high agricultural productivity and NTA biodiversity and abundance. Based on these strategies, a report will be prepared for the European Food Safety Authority (EFSA) with recommendations on optimal landscape structuring.