DESCRIPTION FOR THE GENERAL PUBLIC

On the one hand, the modern high-intensity agriculture is beneficial, allowing to feed the ever-growing human population, but on the other, it became one of the main threats to biodiversity. In areas dominated by intensive agriculture, not only significant decreases in population numbers of many species is observed, but some species get locally extinct, what results in the decrease in species richness. The most endangered organisms are so-called "non-target arthropods" (NTA), inhabiting areas treated with pesticides not directed against them on purpose. The ground beetles (Carabidae) are the prime example. Carabidae, represented in Poland by over 500 species, are frequently used in studies on effects of environmental changes on biodiversity, mostly due to high number of species belonging to this family, their ubiquitousness in virtually all terrestrial environments and easy collection methodology. Many carabid species are used as bioindicators of changes in the environment. They may indicate effects of climate change, heavy metal contamination or urbanization, providing valuable information on changes in populations and biodiversity caused by human-made changes in the environment.

Carabids inhabit also agricultural areas, where they are very important from the economic point of view, because, being predators, they are effective in controlling pest populations. Therefore, the extinction of these beetles, similarly to other predatory arthropods, such as ladybugs (Coccinellidae), spiders (Araneae) and a range of pest parasites and parasitoids, inevitably leads to increased pesticide use, thereby increasing food prices and environmental contamination. Biodiversity is also a value by itself, apart from any direct economic measures. We need, thus, to make every effort to stop the extinction of species and protect the biodiversity. Unfortunately, we still do not understand the processes that affect organisms living in the agricultural landscape. The extensive pesticide use, disappearance of field margins, increasing surface area of agricultural fields and decrease in habitat diversity are certainly some of the main factors responsible for the observed biodiversity crises. It is not known, however, what is the relative importance of each of these factors and interactions between them and is it possible to find a solution allowing for maintaining high agricultural productivity, requiring using pesticides, while protecting the biodiversity of non-target organisms.

The aim of this project is to understand the mechanisms that control the NTA biodiversity in agricultural landscapes, using carabids as a model group. The studies will focus on relative impact of pesticides, landscape structure, local habitat diversity and interactions between these three factors to ground beetle diversity. We will also address the question, what are the costs of living in a transformed environment, by studying the sensitivity of selected species towards pesticide and natural stressor. In one selected species we will also study the problem of inheritance of resistance to pesticides. Although inheritable resistance to pesticides has been found in many pest species, it is not known if, and to what extent, this process happens also in beneficial NTA, like carabids. While in case of pest species the increase in resistance to pesticides is a highly undesired phenomenon, in NTA it would be a positive process, allowing them to survive in agricultural land. On the other hand, there are well-grounded premises suggesting that such adaptations to toxic chemicals may be energetically costly, resulting in increased susceptibility to other, natural stressors. The studies will address also this question. Although the project is not intended to solve practical problems, in the long run its results may provide the basis for developing strategies for better spatial planning in agriculture, that would allow for the use of pesticides, while restoring and maintaining biodiversity and increasing economic productivity of agriculture.