

One of the greatest challenges of modern biology and nature conservation is the fight with invasive plants. Usually they are alien species that were moved outside the range of natural habitat, where they modify habitats, win competitions with native species, and are successful, which allow them to explode. However, not all alien species become invasive. Under certain conditions, also native species can enter the phase of uncontrolled expansion, for example due to the habitat disturbances or lack of natural enemies. There is an urgent need to understand the phenomenon of invasiveness. While the characteristics of the species likely to become invasive are quite well described (high environmental plasticity, ability to produce and spread large numbers of seeds), the degree of habitat transformation and the time from the introduction when the species becomes invasive are still poorly understood and unpredictable.

Two species of hogweeds from the Caucasus region are particularly vulnerable to knowledge of invasions, but they seriously threaten biodiversity in many European countries, and also poses danger to the health or life of humans and animals. These are: the Sosnowski's hogweed *Heracleum sosnowskyi* and the giant hogweed *Heracleum mantegazzianum*. They contain toxic furanocoumarins, which cause burn-like skin dermatitis, especially after exposure of skin freshly touched by those plants to the ultraviolet light. In the era of socialism, which dominated many of the Eastern European countries, Caucasian hogweeds under the top order of communist authorities were planted as a feedstock for cattle in the former large farms (in Poland called State Farms; in Ukraine or Belarus: kolkhoz, etc.). They were also used for decorating gardens and as a benefit for honeybees. After the fall of communism and agricultural reforms in the 1990s, agriculture is in a regression phase, while Caucasian hogweeds in the abandoned crops became invasive. Paradoxically, increased heterogeneity (diversification) of the agricultural landscape may have contributed to this invasion. Many small farms with numerous roads, ditches, randomly distributed abandoned crops, could promoted spreading of the plant seeds. Those plants also transform the habitat where they live, preventing other species from survival. The ability to produce huge amount of seeds favours monopolisation of habitats and formation of dense patches. An aspect worth examining is the attractiveness of hogweeds for some pollinators, e.g. honeybees. In the era of regress in diversity of pollinators, this may inhibit pollination of other plants.

Field research will be carried out in the agricultural landscape of Poland. In 2019, it is planned to make an inventory of birds, by counting them from 60 points located in grassland habitats with varying degrees of invasion of Caucasian hogweeds. Bird counts will be matched in pairs, one of which will be control without Caucasian hogweeds or with their minimal effect, while the second point will be in the same habitat, but in the vicinity of larger patch of hogweeds. The observer will wear overalls, glasses and a mask to protect against chemical contamination. During counts, all seen and heard birds will be noted within 100 meters from the observer, during 10 minutes. To prevent double counting of the same birds, points will be at least 250 meters apart. Points will be double-checked: between April 15th and May 15th and then between May 16th and June 15th; always from dawn to 11 o'clock. Birds will be classified into food groups, because the presence of hogweeds can have different effects on insectivores, herbivores and omnivores. During field controls, there will be recorded exact number of breeding pairs, and bird individuals will be marked on the map. The types of habitat will be described within a radius of 100 meters from each point after the second field control. Counting birds at the same points will be repeated in 2020. The effect of Caucasians on birds is unknown – it is not known whether they are hurt by furanocoumarins and if they avoid high flowering plants. Then, it is planned to investigate the impact of fragmentation of agricultural landscape environments on the spreading of Caucasian hogweeds. With the help of the Internet, a database of 300 locations of former State Farms, that existed before 1990, will be developed for Poland. They will be marked on the map along with the nearest alien hogweeds' sites to spatial analyses. In 2019, 30 locations of aliens will be selected. In each of them will be designated three squares of 10x10 meters, with a minimum spacing of 50 meters apart, each of which will have a different percentage of alien hogweeds' coverage. Those will be research areas, on which fauna of insects will be inventoried in order to detect for which insects Caucasian hogweeds are attractive and whether the presence of these plants changes the surrounding insect species composition.

The results of research will show what is the limit value of modification and maintenance of habitat by alien plant species where Caucasian hogweeds become invasive. The project is of practical importance because there is an urgent need to understand the scheme of large-scale distribution of Caucasian hogweeds to eliminate sources of their invasion at first, and then to remove the sites resulting from spreading of the plant probably along rivers, roads, ditches and railway lines. There is lack of studies describing invasions closer at different levels of invasion of alien plants in various habitats. Because that is the key in this project, it will make an important contribution to science. It is worth emphasising, that Sosnowski's hogweed was brought to many European countries just before Josef Stalin's death in 1953 as a result of doubtful Soviet research and is called "Stalin's revenge". Modern science of the 21st century should now fix that mistake of the former Soviet researchers, and therefore to settle the past; proposed tests will give a chance for that.