The biological basis of the endangered relict species from the Salicaceae family conservation in eastern Poland

In the years 2010-2016, studies on the biology and ecology of two willow species, Salix lapponum and S. myrtilloides, were conducted to determine the methods of their conservation.

In the first stage, data on the resources and condition of the population of both species surveyed in Polesie Lubelskie Region was updated. It showed an 80% decrease in the number of S. lapponum stands in Polesie Lubelskie Region since the 1950s. The existence of 5 from 35 stands was confirmed in the study area, regarding the populations, 18 were considered as extinct and 11 were not confirmed in the earlier described locations. In case of S. myrtilloides, only 3 populations were confirmed. The remaining stands given in the literature (34 stands in Łęczyńsko-Włodawa Lakeland) no longer exist.

Ecological and biological studies

It has been found that the predominant propagation of both S. lapponum and S. myrtilloides is the generative reproduction. It is demonstrated by the high pollen grains viability and germination ability, high germination capacity of seeds, and the results of genetic analyses confirming the absence of clones in the studied populations.

Genetic diversity

The genetic diversity between the populations of both S. lapponum and S. myrtilloides was not high, but statistically significant, indicating established differences in allele frequencies and lack of gene flow (ISSR analysis). This result is not surprising as, since the mid-twentieth, the changes in the environment were mainly caused by anthropogenic factors which resulted in habitat fragmentation and displacement of the species with narrow ecological tolerance. Despite this, the relatively high diversity within the population preserves the survival of the species in the study area.

Reproduction and life cycles processes

Salix myrtilloides L. (weeping willow) is a deciduous small shrub growing to 15–80 cm tall, strongly related to raised and transitional peat bogs habitat. S. myrtilloides is an Eurosiberian species, its range covers Eastern and Central Europe as well as almost the whole of Siberia. The western limit of its range runs through Poland, in the regions of Sudety, Tatra and South Carpathian Mountains. Isolated stands of S. myrtilloides can be found in the Swiss Alps, in the mountains of southern Bavaria, and in the Far East valleys. S. myrtilloides is considered in Poland as a glacial relict species. In the 1950’s it was reported in about 90 locations, but most of these stands do not exist any longer. It has been under a full protection in Poland since 1981. It is included in the ‘Red List of Plants and Fungi in Poland’ as a critically endangered species (category of threat II) and in the ‘Polish Red Book of Plants’ as an endangered species (category of threat – EN). The main threat to S. myrtilloides populations is indirect and direct human activity, habitat exploitation, drainage of peat bogs, and expansion of other woody species.

Protection by reintroduction

It was decided that propagation ex situ and reintroduction of the obtained specimens would be the most effective methods of active conservation of the species. Due to a very low amount of plant material and unsuccessful germination of seeds, micropropagation was chosen as the only possible way to obtain young plants.

The acclimatization stage was conducted in high humidity conditions, temperature of 20°C and light intensity of 30 µmol s⁻¹ m⁻² at 16-hour photoperiod. More than 90% of plantlets survived acclimatization process.

The obtained plants were reintroduced into natural stands in the third decade of May 2017. At present, the plants are monitored to develop the methods of active protection of the Salicaceae species.

In vitro cultures of the endangered species might be a key stage of active conservation, thereby making it possible to preserve gene resources of S. lapponum and S. myrtilloides and other plants that are threatened with extinction.