Project Update: September 2016

The next part of summer field expeditions of the project «Status and Structure of Populations of Rare Arctic-Alpine Plant Species in Highland Ecosystems of Ukrainian Carpathians» took place in the south-eastern part of Chornohora, Svydovets, Marmaros and Chyvchyny Mts. The study was conducted on protected (Carpathian Biosphere Reserve and The Carpathian National Nature Park) and non-protected nature areas. The objects of our study are populations of the next rare arctic-alpine species: *Alium sibiricum* L., *Anemone narcissiflora* L., *Aster alpinus* L., *Bartsia alpina* L., *Carex pauciflora* Light., *Cerastium lanatum* L., *Cerastium cerastoides* (L.) Britt., *Dryas octopetala* L. *Empetrum nigrum* L., *Epilobium alpinum* L., *Huperzia selago* (L.) Bernh. Ex Schrank et Mert., *Juncus castaneus* Smith., *Lloydia serotina* (L.) Rchb., *Loiseleuria procumbens* (L.) Desv., *Lycopodium alpinum* L., *Pedicularis oederi* Vahl, *Pinguicula alpina* L., *Pseudorchis albida* (L.) A.Löve et D.Löve, *Rhodiola rosea* L., *Salix bicolor* L., *Salix herbacea* L., *Saussurea alpina* (L.) DC., *Saxifraga adscendens* L., *Saxifraga aizoides* L., *Saxifraga stellaris* L. subsp. alpigena Temesy, *Sedum anuum* L., *Selaginella selaginoides* (L.) Beauv. ex Schrank et C.F.P. Mart.

We determined that rare arctic-alpine species of plants are associated with seven types of habitats in the highland ecosystems of Ukrainian Carpathians. Habitats were determined in accordance with Annex 1 («Natural habitat types of community interest whose conservation requires the designation of special areas of conservation») of the Habitats Directive («Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora»). Definition of habitats in accordance with Habitats Directive promotes adaptation of Ukrainian approaches to European standards. In particular, we have singled out the next habitat types of studied species: Siliceous scree of the montane to snow levels (*Cerastium cerastoides, Empetrum nigrum, Huperzia selago, Loiseleuria procumbens, Lycopodium alpinum, Salix herbacea, Sedum anuum*), calcareous and calcschist screes of the montane to alpine levels (*Anemone narcissiflora, Aster alpinus, Bartsia alpine*, *Dryas octopetala, Cerastium lanatum, Lloydia serotina, Rhodiola rosea, Saussurea alpina, Saxifraga adscendens*), Alpine and subalpine calcareous grasslands (*Anemone narcissiflora, Selaginella selaginoides*), calcareous fens (*Pinguicula alpina*), active raised bogs (*Alium sibiricum, Carex pauciflora, Empetrum nigrum, Pseudorchis albida*), petrifying springs (*Pinguicula alpina, Saxifraga aizoides*), mineral-rich springs and spring fens (*Epilobium alpinum, Juncus castaneus, Pedicularis oederi, Pseudorchis albida, Salix bicolor, Saxifraga stellaris*).

During our field work and analysis of populations of rare arctic-alpine plants, we defined the relevant conservation status of researched species in accordance with categories of actual international IUCN classification. Below is a table where are indicated the conservation status of the species in Ukraine today and defined proposals of conservation status according to IUCN classification.

Table 1
The conservation status of rare arctic-alpine plant species in Ukraine

№	Species	Conservation status in Ukraine*	Proposed conservation status*	№	Species	Conservation status in Ukraine*	Proposed conservation status*
Threatened species				Low risk of extinction			
1	*Aster alpinus*	R	VU	18	*Alium sibiricum*	---	LC
2	*Bartsia alpina*	---	VU	19	*Anemone narcissiflora*	VU	NT
3	*Carex pauciflora*	VU	VU	20	*Cerastium lanatum*	---	NT
4	*Cerastium cerastoides*	R	EN	21	*Empetrum nigrum*	---	LC
5	*Dryas octopetala*	R	EN	22	*Epilobium alpinum*	---	LC
6	*Lloydia serotina*	R	CR	23	*Huperzia selago*	NE	LC
7	*Pedicularis oederi*	EN	CR	24	*Juncus castaneus*	---	NT
8	*Pseudorchis albida*	VU	VU	25	*Loiseleuria procumbens*	R	NT
9	*Rhodiola rosea*	VU	VU	26	*Lycopodium alpinum*	R	LC
10	*Salix bicolor*	---	VU	27	*Pinguicula alpina*	R	NT
11	*Salix herbacea*	R	VU				
12	*Saussurea alpina*	R	EN				
13	*Saxifraga adscendens*	---	EN				
14	*Saxifraga aizoides*	EN	CR				
15	*Saxifraga stellaris*	---	VU				
16	*Sedum anuum*	---	VU				
17	*Selaginella selaginoides*	VU	VU				

*CR – critically endangered, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern, NE – not evaluated, R – rare, --- – conservation status non-available

We made interactive online map with detailed information about geographical location of populations of studied species (http://bit.ly/2bvTGNO). Such a database which shows detailed geographic coordinates, distribution, spatial structure and conservation status of researched species in highlands ecosystems is important and necessary for future analysing and monitoring the condition of their populations by employees of relevant scientific or conservation institutions.

The influence of external factors on populations of rare arctic-alpine species was analysed. We identified the main natural and anthropogenic factors that have negative or positive affects on populations. Overgrowing of rocky habitats by shrubs and raising the upper limit of the forest have negative impact on the vitality of researched populations. For example, overgrowing of favorable habitats by *Alnus viridis* (Chaix.) D.C. and *Pinus mugo* Turra, causes reducing population area of *Lloydia serotina*. That is why it is important to control such process and if it is necessary to use the method of active protection - thinning of shrubs cover and elimination of more competitive species. Another danger - it is a changing of population conditions and degradation of characteristic types of habitats due to the climate change. For example, drying out of the mesophytic meadows or alpine bogs may cause the decreasing of population of *Pedicularis oederi* or *Carex pauciflora*.

Trampling can also have negative or positive influence on populations. The main factors are recreation, tourism and farming - especially grazing. For example, uncontrolled grazing causes decline of generative reproduction in populations of *Saussurea alpina*, but grazing can also be effective instrument of preventing deforestation on grasslands where a lot of rare species can exist. Moderate trampling by tourist can stimulate vegetative reproduction of *Loiseleuria procumbens* and *Salix herbacea* that accelerate occupation of free areas by these species. Uncontrolled recreation, especially on vehicles, causes soil erosion and has negative impact on arctic-alpine species.

Raising the upper limit of the forest.

Overgrowing the habitat of arctic-alpine species.

Data gathering in the field.

Sheep grazing on alpine meadows.


Highland research station of the Vasyl Stefanyk Precarpathian National University on the top of Pip Ivan mountain in Chornohora (Ukrainian Carpathians).


Uncontrolled recreation in the alpine environment.


Near the information board of Carpathian Biosphere Reserve and on the path of the tourist route in the highland of Ukrainian Carpathians.

Our summer house

Carex pauciflora Light.

Bartsia alpina L.

Aster alpinus L.

Pedicularis oederi Vahl

Pseudorchis albida (L.) A.Löve et D.Löve

Cerastium cerastoides (L.) Britt.

Dryas octopetala L.

Rhodiola rosea L.

Salix bicolor L.

Salix herbacea L.

Saussurea alpina (L.) DC.

Saxifraga stellaris L. subsp. alpigena Temesy

Anemone narcissiflora L.

Juncus castaneus Smith.

Lycopodium alpinum L.

Selaginella selaginoides (L.) Beauv. ex Schrank et C.F.P. Mart.

Alium sibiricum L.

Sedum anuum L.

Cerastium lanatum L.

Empetrum nigrum L.

Huperzia selago (L.) Bernh. Ex Schrank et Mert.

Pinguicula alpina L.

Loiseleuria procumbens (L.) Desv.