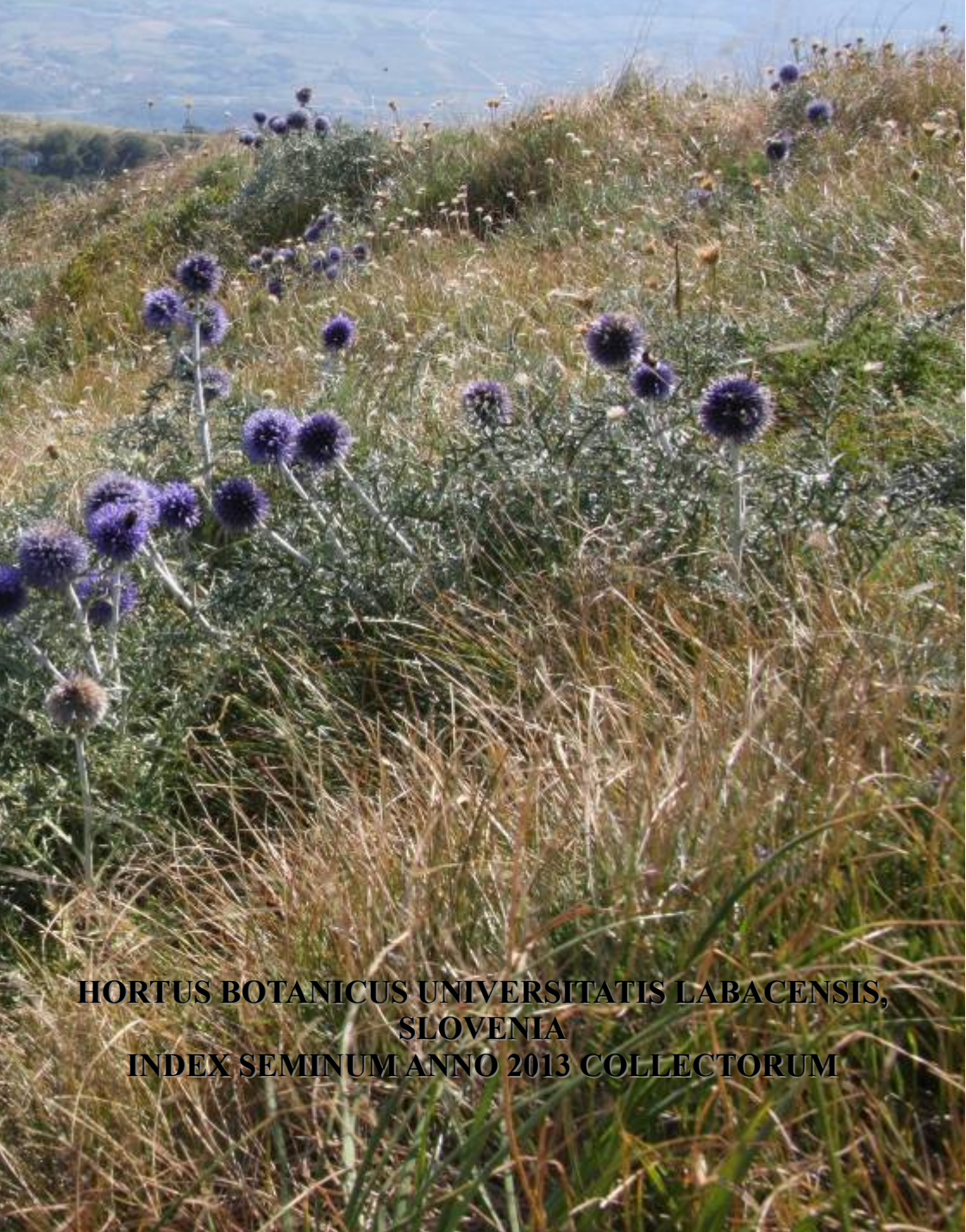


**SEEDS COLLECTING FOR *IN SITU* AND
EX SITU CONSERVATION PURPOSE**



**HORTUS BOTANICUS UNIVERSITATIS LABACENSIS,
SLOVENIA
INDEX SEMINUM ANNO 2013 COLLECTORUM**

SEEDS COLLECTING FOR *IN SITU* AND *EX SITU* CONSERVATION PURPOSE

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SEEDS COLLECTING FOR *IN SITU* AND *EX SITU* CONSERVATION PURPOSE

Blanka Ravnjak & Jože Bavcon

Abstract

The University Botanic Garden Ljubljana has a long tradition of *in situ* and *ex situ* conservation. Since its beginning, they started to collect native plants for conservating in the Garden. Some of the plants, like *Pastinaca sativa* var. *fleischmanni*, are even extinct in the nature and survived only in the Garden.

Also, nowadays, the University Botanic Gardens Ljubljana still maintains the tradition of collecting seeds for its own seed bank and publishes the *Index seminum*. Each year we are trying to collect the seeds from as many plant species as possible, species that are growing either in the garden or free in nature.

Since 2000, the University Botanic Gardens Ljubljana has also been involved in *in situ* monitoring and in conservation of not only certain plants, but also important habitats, f.e. the dry meadow on the area of capital city of Slovenia – Ljubljana. In 2013 we also accepted the possibility for participation in collecting seeds for *Millennium Seed Bank*.

we collected seeds of 59 target plant species (being already selected before for collecting) for the *Millennium Seed Bank* and 257 for our own Garden seed bank.

Keywords: Slovenian flora, *in situ* conservation, *ex situ* conservation, seed collecting, Millennium Seed Bank

1. Introduction

The University Botanic Garden Ljubljana has a long tradition of endangered species conservation. Since its beginning, they started



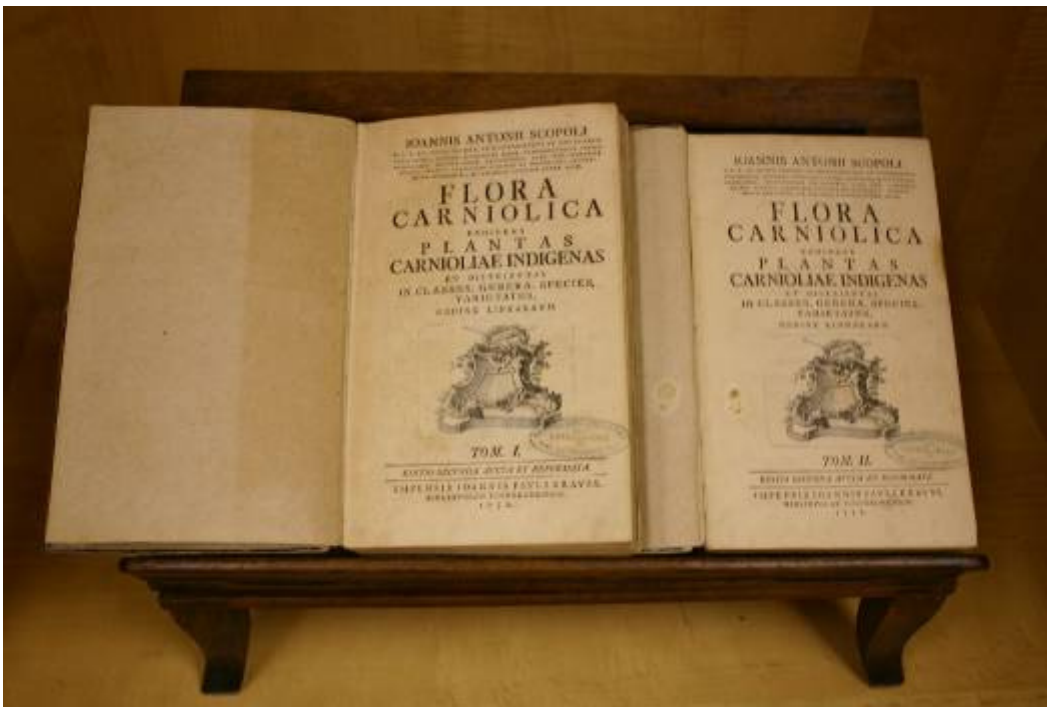
Pastinaca sativa var. *fleischmanni* since 2012 again on Ljubljana castle hill.

to collect native plants for conservating in the Garden (Freyer 1829, Voss 1884, 1885, Paulin 1912, Praprotnik 2010). Some of the plants, like *Pastinaca sativa* var. *fleischmanni*, are even extinct in the nature and survived only in the Garden. This species has originally grown in a Garden neighbourhood, on the Ljubljana castle hill. Not only plant and seed collecting, but also spreading the knowledge of the importance of native flora, was another very important aspect. Today we call it awareness about biodiversity protection, which is also mentioned in different documents (CBD, GSPC). At the beginning of the Garden, its founder Franc Hladnik started with public lectures about the native flora (Praprotnik 1994, 2012). After him, also his successor continued that important work. Up to now we still have a public lectures, workshops and different guided tours (Bavcon et al. 2004, Bavcon 2010, Bavcon et al. 2011).

Slovenian flora has been explored already in the pre-Linnaean era. First record of Slovenian plant names originates from 1415: *Liber de simplicibus Benedicti Rinii*. Pietro Andrea Matthioli (1501-1577), who made first records about plants on the part of the territory of today Slovenia in his work *Commentarii in libros sex Pedacii Dioscoridis Anazarbei de materia medica* (Matthioli 1570) and Carolus Clusius (1526-1609) with his work *Stirpium Nomenclator Pannonicus* are considered as first naturalist that studied the flora of Slovenian territory (Petkovšek 1967, Gosar & Petkovšek 1982). Valvasor (1685) has especially pointed out that the natural wealth of this area needs to be presented to broader central-European region.

On mid of the 18th century the peak of research activities definitely is represented by Joannes Antonius Scopoli (1723-1788). Scopoli arrived to Idrija in 1754 as the first mine physician and worked here until 1769. Besides treating the Idrian miners who here were mining for quicksilver ore, and were getting sick due to inhalation of quicksilver fumes (Pfeifer 1989), he was also exploring flora and fauna. Not only exploring the narrow surroundings of Idrija, he also travelled through the major part of the Carniola region. In Vienna, 1760, he published in Latin the first edition of *Flora Carniolica*, where 1000 species of higher and lower plants were covered (Petkovšek 1960, 1977; Wraber 1997). In 1772 the first edition was followed by the second, more extensive edition in two books, where he was already using the binary nomenclature (Scopoli 1772).

Between years 1760 and 1775 Scopoli was in for that time rather intense correspondence with the famous Swedish botanist Carl Linné. Already from the second letter by Linné to Scopoli sent on August 15th, 1761 it can be seen, that besides his work *Flora Carniolica* Scopoli also sent Linné 90 specimens of rare plants that Linné didn't got yet as he was complaining in his letter (Soban 2004). In his third letter (December 28th, 1761) Linné asks Scopoli for seeds of "*Atropa 2*". This was the name Scopoli gave to the, at that time unknown, species, nowadays known as Carniolan scopo-



Flora Carniolica 1772

lia (*Scopolia carniolica*). The plant was named later by Joaquin in honour to Scopoli. Besides, he also asks for dry exemplars of plants and seeds from more than 33 other species. In his fifth letter (June 20th, 1763) Linné again asks for seeds of the plant named *Hyoscyamus*, which he named *H. scopolia*. Also in his sixth letter (August 29th, 1763), besides other things Linné complains that the *Atropae*-looking *Hyoscyamus* still has not sprouted from the seeds. However, in his eleventh letter (March 8th, 1771) he already states: »Your *Scopolia* is growing lush in my garden, a truly unique plant« (Soban 2004).

The other very important polihistor of that time, Balthasar Hacquet (1739 or 1740-1815), was lured to Idrija just because of the Scopoli's famous name. Between 1773 and 1787 he was also active in Ljubljana. He was a versatile scientist. He was studying and gathering plants for a herbarium collection and published his work *Plantae alpinae carniolicae* (Praprotnik 2003, Šumrada 2003). An-

other important man, who had a great influence on work at new established *Native flora* garden (Botanic Garden in Ljubljana) was Franc Ksaver Wulfen (1728-1805). He was the first mentor of the founder of the Garden, Franc Hladnik (Praprotnik & Wraber 1998). Wulfen was active in Slovenian area: between 1755-1761 in Gorica and in 1762-1763 in Ljubljana. During his activity in Slovenian area he travelled through the major part of today's western Slovenia (Praprotnik & Wraber 1998). He worked with Scopoli and after his death they published his flora (Wulfen 1858).

Hladnik himself, the first Head of the Botanic Garden, already had a smaller garden in *lyceum* in the area of today's city market. A few documents exist, where this correspondence was mentioned. In the letters from Wulfen from Klagenfurt (April 7th, 1803), he is asking for several plants as well as in his letters from July 4th, 1803 (Rechfeld 1849, Benkovič 1898, Praprotnik 2012). In 1812, during the times of Ilirian provinces, Host, a botanist from Vienna, contacted Hladnik and again asked for data about willows and various plants from Carniola while stating that he lost most of them in his botanic garden (Rechfeld 1849, Benkovič 1898). In 1815 Gorgio Jan, an assistant of Jacquin, who was later working in Parma and Milan, is asking Hladnik for plants (Praprotnik 2012). There was continuous correspondence and plant exchange with Host going on (Rechfeld 1849, Praprotnik 1994). In 1825 Welden asks him for Carniolan plants while stating: »...you are truly living on classical soil that offers many interesting things« (Welden 20 June 1825 after Rechfeld 1849). In his later letters he claims, that baron Jacquin and count Sternberg also asked for rare plants that he has sent him (Rechfeld 1849). In one of the letters also Hladnik's gardener Fleischman is mentioned. Welden asks for Hladnik's approval for Fleischmann to gather some plants for him in his excursions. As well Hladnik alone (ZAL 184), as well as with his gardener, have travelled all over the land of Carniola (Freyer 1829, Babnigg 1848, Rechfeld 1849, Rozman 1853, Benkovič 1898, Praprotnik 1993, Praprotnik 1994, Praprotnik 2010a, Praprotnik 2011, Praprotnik 2012).



Order for seeds from Botanic Garden in Ljubljana by Royal Botanic Garden Kew in 1892.

2012). The fact that Hladnik in his era was well known to Mid-European botanists is reflected in several plant names named after him (Rechfeld 1849, Babnig 1848, Praprotnik 2012). Data sent by Hladnik was used as well by German botanist Koch in various editions of his *Synopsis of German and Swiss flora* (1835-1837, 1838, 1843-1845), as by Reichenbach in his work (Praprotnik 1994, 2010a, 2012).

By Alfonz Paulin the Garden came on a very intensive exchange of

seeds with the published *Index seminum* (Paulin 1912). The first one was published in January 1889 (Paulin 1912, Bavcon 2009). According to the available data, the *Index seminum* was distributed to 78 botanic gardens all over the Europe (Lazar 1960). He was keen on nature conservation but while the related paper remained in manuscript it reveals his focused and professionally accomplished action in Slovenia (Mayer 1988). He also states that the moorland plants have to be cultivated in a substitute habitat in the Botanic Garden as they will soon have disappeared from Ljubljansko barje moor (Paulin 1912). In 1901 Paulin also started to publish dried herbarium collection *Flora Exsiccata Carniolica* that was published in hundreds all until 1936 and contained 2000 taxons (Dolšak 1936, Wraber 1966, Wraber 2008).

Slovenian flora is very rich, according to the small territory of the country (Mršič 1997). All of this is because this is a country on drafts, where different geoclimatic influences come into contact. North-western end central part belongs to the Alps, south-western part is sub-Mediterranean, north-eastern and eastern part are sub-Pannonian, while south-western and central south part belong to the Dinaric area. Phytogeographically, Slovenia is divided into four main and two transitional phytogeographic regions. All this gives Slovenia a special charm, being reflected in its plant diversity. On a relatively small area of 20 256 km², 3452 species are present, of which 3119 are indigenous (Martinčič et al. 2007).

Also, nowadays, the University Botanic Gardens Ljubljana still maintains the tradition of collecting seeds for its own seed bank and publishes the *Index seminum*. Each year we are trying to collect the seeds from as many plant species as possible, species that are growing either in the garden or free in nature (Bavcon 2009, 2010, 2011). In our seed bank each year we are trying to renew the seed stock of those plant species that in the nature are either endangered in any kind or they are of special importance for Slovenian flora. In case of drastic reduction in population of a certain plant species the seeds stored in our seed bank enable us to

reintroduce the species and in this way contribute to conservation of plant biodiversity. In the past, during 1970-ies, the Garden was engaged in cultivation of an extremely rare species, namely, *Degenia velebitica*, an endemic of neighbouring Croatia, reintroduced from here to its natural habitat on Velebit Mt (Strgar 1979). A more recent case of successful reintroduction is the reintroduction of *Pastinaca sativa* var. *fleischmanni* to its original location at Ljubljana castle in 2011 (Bavcon 2013).

Since 2000, the University Botanic Gardens Ljubljana has also been involved in *in situ* monitoring and in conservation of not only certain plants, but also important habitats, f.e. the dry meadow on the area of capital city of Slovenia – Ljubljana. For this, we have on lease a very rich dry meadow (Bavcon & Marinček 2004) which was the aim of research also in the past (Wulfen 1858, Tomažič 1940) and was in a such condition up to today time (Bavcon 2010, 2013), where also a certain amount of endangered species are growing.

For this reason we gladly accepted the possibility for participation in collecting seeds for *Millennium Seed Bank* in order to contribute to faster achievement of the goal of collecting seeds from 20 % of the total world flora. At the same time, this is an opportunity to store seeds of rich Slovenian flora in such a superior seed bank as the *Millennium Seed Bank*. Simultaneously, this reach Slovenian biodiversity is also introduced beyond the borders of Slovenia.

2. MATERIALS AND METHODS

The key factor for selecting target plant species, which seeds we wanted to contribute, was mainly its conservation status at local and global point (Wraber & Skoberne 1989, UR RS 2002, <http://www.iucnredlist.org/> 2014). We placed on *Target species plant list* mainly those species which are especially important for Slovenia. Among them are surely plant species with its *locus classicus* in

Slovenia, or are endemic for this or wider region.

2.1 Description of sampling sites

Slovenia lies between northern latitudes of 45°25' and 46°53' and eastern longitudes of 13°36' and 16°36'. It is geographically positioned approximately in the middle of the northern temperate climate zone. It has mainly temperate warm climate under additional favourable impact due to the vicinity of the Mediterranean Sea. Sufficient precipitation and favourable temperature allow for more than 60 % of the country to be covered by woods (Lovrenčak 2004). In Slovenia four geographical macro-regions come into contact: Alpine, Dinaric, Pannonian and Mediterranean. The major part of Slovenian area belongs to the Alpine macro-region which includes also the sub-Alpine terrain. Each of the regions nowadays has its own climate and geographical characteristics as a consequence of the past geoclimatic events. The result of this contact is the geological, geographical and climate variety across all Slovenian territory. Geoclimatic events in the Earth's history, today's form of the relief and climate conditions all are factors which in the Slovenian area impact the rich species diversity of fauna and flora, along with variety of ecosystems and habitat types. Compared to area of other countries, Slovenia has a disproportionately high biotic diversity. For this reason sometimes it is being called as "the hot spot" of Europe (Mršič 1997).

The seeds for the *Millennium Seed Bank* were collected on 37 different locations. Here the size of the area where seeds were collected was dependent on the population areal of each individual plant species chosen in the area. For this reason, the area sizes for seeds collecting were between 50 m² and 500 m². According to M. Wraber (1969) Slovenian area can be divided into six phytogeographic regions. The majority of seeds collecting sites were located in sub-Mediterranean and Dinaric phytogeographic region.

In Alpine phytogeographic region we collected seeds at only one

location, which is in Karavanke Alps. The location is special because it is on the most eastern peak of these Alps, in the Carinthia (north of Slovenia). This peak is an extensive and isolated massif of highland Karst with its typical surface and underground phenomena (www.geopark.si). Seeds were collected in wet mixed forest on northern slope.

We collected seeds also at some other high mountain locations in sub-Alpine phytogeographic region. Those were mostly at Cerkljansko hills and plateau Jelovica. The main characteristics of this area is a moderate temperate continental climate, however with some exceptions, and for this reason here we can speak about moderate temperate continental climate of western and southern Slovenia. Its main characteristic is also high amount of precipitation. The reason of high precipitation is that these hills are representing a barrier against air masses from south, which means higher precipitation. The bedrock is very diverse, dominating are limestones and dolomites in which post-carbonate soils have formed (Seljak 1974). The majority of seeds were collected on overgrowing grasslands and pastures. Also on a former pasture, the seeds of the endemic target species *Primula carniolica* were collected. This area lies in the transition from Alpine to Dinaric region which is reflected also in its vegetation. Here occur both thermophilic as thermophobic species. Still in sub-Alpine phytogeographic region are the locations not far away from the municipality of Ljubljana (the capital of Slovenia). The other locations are part of Ljubljana moor (Ljubljansko barje). This is an area criss-crossed with water streams and drainage channels that also serve as borders between individual plots, there are also many extensive mowed meadows there. On the wet meadow the soil consists of peat and in spring it is very wet due or even flooded due to precipitation. Here we collected the seeds of various plant species at the edge of a mixed coniferous and deciduous forest.

As already mentioned before, the majority of collecting locations belongs to the Dinaric phytogeographic region. These locations



Primula carniolica

are mostly placed on a Karst high plain, called Trnovski forest (Trnovski gozd). Its surface is approximately 120 km², 25 km in length and in 5 to 10 km wide (Zupančič 1980). The altitude of Trnovski gozd plateau is between 800 and 1400 m. The bedrocks in Trnovski gozd are Mesozoic limestone and dolomite, but on its southern and western side there are flysch rocks. The soil depth is disunited and variable. The deepest soils are in spaces between rocks and stones. As structured as the plateau relief is, so various are also climate regimes. Climate is Dinaric-continental with a sub-Mediterranean influence on one side and with Alpine influence on the other side. Between them many local climate regimes have formed. The variability of Trnovski gozd area has a big effect also on winds. Here the *bora* wind prevails and seldom strong, cold and dry winds are blowing. However, southwest warm and wet sea winds are very frequent (Zupančič 1980). Seeds were mostly collected on dry Illyrian sub-Mediterranean grasslands (Kaligarič 1997a). The grasslands are oriented to south or southeast and

some of them are even at the edge of rocky overhang above the Vipavska valley. All of them are exposed to the sun and strong *bora* wind during the whole year. The terrain is rocky, occasionally with gravel. Some of these meadows are also pastures for sheep and cattle. Furthermore three seed collecting sites were near the walking path in beech forest. Still in the Dinaric phytoecographic region but quite dislocated from Trnovski gozd is the Snežnik locality, which represents the western part of the Dinaric Mountains. It is a diverse Karst relief crisscrossed by Karst phenomena, collapse pits being the most significant among them. The central part of the massif as well as top of Snežnik consists of limestone. The soil on Snežnik massif is mainly brown polycarbonate, rubbly slopes and peaks are covered with rendzinas. On the Snežnik plateau Mediterranean and continental climate combine. Wetness in Snežnik is very high as there can be as much as 3500 mm of precipitation per year, whereby the majority of this falls in October, November and December. The plant seeds were collected on the top and along the gravel trail.



Snežnik moutain

Another phytogeographic region, where the majority of seed was collected, is the sub-Mediterranean one. This area actually represents Slovenian coastal region separated by Dinaric Mountains. The climate here is strongly influenced by the Mediterranean, whereby the sharpness of weather factors is changing depending on the distance from the sea and on the altitude. This area becomes as much as 2000 hour of sun per year, with average temperature between 2 °C to 4 °C in January and 22 °C to 24 °C in July (Kaligarič 1997a). The relief of this area is structured in Karst plateaus, small and big hills. The bedrock is limestone and flysch, so the Karst features are also present. Mostly we collected plant seeds on Karst plateaus where the plant diversity is really high and differs from one to another plateau. The highest among them is Nanos, a geographical and also a climate border. Another border-like plateau is Kraški rob. It is a plateau-like landscape with steep, often broken tectonic edge. It consists of limestone and is representing between the limestone and flysch landscape in Istria. Lower lying plateaus are Vremščica, Sočerga and Podgorski Kras.



Karst edge

Species	Status
<i>Abies alba</i> Mill.	least concern
<i>Aconitum variegatum</i> L.	
<i>Allium senescens</i> L.	
<i>Anthericum ramosum</i> L.	
<i>Arabis sagittata</i> (Bertol.) DC.	
<i>Arabis turrata</i> L.	
<i>Asphodelus albus</i> Mill.	vulnerable
<i>Centaurea rupestris</i> L.	
<i>Cirsium pannonicum</i> Link	
<i>Coronilla emerus</i> L. subsp. <i>emeroides</i> Boiss. & Spruner	
<i>Cortusa matthioli</i> L.	rare
<i>Cotinus coggygria</i> Scop.	
<i>Crithmum maritimum</i> L.	
<i>Dianthus tergestinus</i> Rchb.	protected
<i>Dictamnus albus</i> L.	
<i>Dryas octopetala</i> L.	
<i>Echinops ritro</i> L. subsp. <i>ruthenicus</i> (Bieb.) Nyman.	
<i>Eranthis hyemalis</i> Salisb.	protected
<i>Eriophorum angustifolium</i> Roth	vulnerable
<i>Eryngium alpinum</i> L.	protected
<i>Eryngium amethystinum</i> L.	
<i>Gentiana asclepiadea</i> L.	
<i>Gentiana clusii</i> E.P.Perrier & Songeon	protected
<i>Gentiana lutea</i> L. subsp. <i>symphyandra</i> Murbeck	vulnerable
<i>Gentiana pannonica</i> Scop.	protected
<i>Gladiolus illyricus</i> W.D.J.Koch	vulnerable
<i>Grafia golaka</i> (Hacq.) Rchb.	
<i>Hacquetia epipactis</i> DC.	
<i>Hladnikia pastinacifolia</i> Rchb.	endemic
<i>Homogyne alpina</i> Cass.	
<i>Hyssopus officinalis</i> L.	
<i>Inula ensifolia</i> L.	
<i>Inula hirta</i> L.	
<i>Iris sibirica</i> L. subsp. <i>erirrhiza</i> (Pospichal) T. Wraber	endemic
<i>Juniperus communis</i> L.	
<i>Laserpitium siler</i> L.	
<i>Leontopodium alpinum</i> Cass.	protected
<i>Leucojum aestivum</i> L.	vulnerable
<i>Leucojum vernum</i> L.	
<i>Libanotis sibirica</i> W. D. J. Koch	
<i>Ligusticum seguieri</i> Vill.	
<i>Lilium carniolicum</i> Bernh.	protected

Species	Status
<i>Linum narbonense</i> L.	
<i>Linum viscosum</i> L.	
<i>Lonicera alpigena</i> L.	
<i>Marrubium incanum</i> Desr.	
<i>Paeonia officinalis</i> L.	vulnerable
<i>Primula carniolica</i> Jacq.	endemic
<i>Rosa glauca</i> Pourr.	
<i>Rosa pendulina</i> L.	
<i>Ruscus aculeatus</i> L.	protected
<i>Ruta divaricata</i> Ten.	
<i>Satureja montana</i> L.	
<i>Satureja subspicata</i> Bartl. ex Vis. subsp. <i>liburnica</i> Šilić	
<i>Scabiosa graminifolia</i> L.	
<i>Scopolia carniolica</i> Jacq.	
<i>Thalictrum aquilegiifolium</i> L.	
<i>Thalictrum minus</i> L.	
<i>Veratrum nigrum</i> L.	vulnerable

Table: List of target species for *Millenium Seed Bank* and its conservation status according to: Wraber & Skoberne 1989, UR RS

The landscape of the last one is slightly undulating with altitudes ranging between 400 and 500 meters and Karst phenomena not being well developed. Shallow and poorly developed sinkholes, pits and smaller caves indicate that Karstification here is just in its starting phase. Typical here are dry valleys on flysch. Next to the villages there are fields and olive groves (Šiškovič 1997). Majority of plant seeds collecting localities was on dry meadows or grasslands. Mostly these are former pastures that some of them are still being used today (www.vf.uni-lj.si) or they are slowly overgrowing due to summer draught, strong winds and strong southern sun, where the overgrowing is slower. The same habitat type for seed collecting was on two hill tops in the Slavnik and Kojniško mountains. These mountains are built from Cretaceous limestone and dolomite. They start in the north-west and are slowly rising and expanding towards south-east. Besides collecting seeds on dry grasslands, we collected also along the trails, mostly in termophilic forest – namely in beech forest with autumn moor grass (*Seslerio-Fagetum*). Near Slovenian coast at Dragonja, seeds were collected



Dry meadow near Podgorje



Nanos



Dry meadow on Nanos



Stena Dragonja

in the bushes. Vegetation there is considered as the most typical Mediterranean vegetation in the sub-Mediterranean part of Slovenia. It is an isolated limestone insertion in the flysch landscape, with remainders of *maquis* shrubland.

Just in the coastal region of Slovenia we collected the seeds in Izola. This is a limestone island in the former flysch mainland. All natural vegetation here is secondary. The remainders of halophytic vegetation are preserved only in the part of natural coast in front of Petelinji rt. There on limestone rocks as a monoculture in rock crevices, between rocks on the public beach *Crithmum maritimum* is dominant, however further up already secondary vegetation begins. This is a remainder of former natural vegetation that today is appearing as secondary vegetation on built walls along the coast, under influence of tides.

2.2 Field work and seed preparation

Due to a rather long winter and consequently late fruiting of spring plants, we started the field work not before May 2013 and then in the following months until December we carried out one or more days of field work. If weather conditions allowed, we visited localities with target species already before and dug out a flowering plant from the habitat for later herbarisation. Due to the lack of staff and variable weather conditions, for some plants we were not able to collect a herbarium-specimen. For the field work of seeds collecting, we have chosen a day with favourable weather (without rainfall). We never collected seeds after rain, because in this case the drying would last longer with higher probability for seeds to go mouldy. In the field we always collected seeds in as big as possible populations of each plant species, and in order to find the appropriate population often we needed to travel for longer distances on foot. When collecting seeds we always checked for plant species and seed ripeness. In case that the seeds were not ripened enough we stopped collecting and returned to the locality at later time. Seeds were collected into transparent and air bags (each

plant species in its own bag) which were labelled accordingly with plant species name, location (GPS coordinate) and collection date. In some cases we photographed the plant as well as the habitat. The seeds collected were brought to the Botanic garden where were fully dried. Then they were cleaned by hand to such extent, that their volume was significantly reduced. Cleaned seeds were packed into special bags designated for this purpose and labelled the bags with species name, identification number, locality and date of collection. Herbarised plants were put into herbarium sheets and labelled accordingly with basic data about the plant (plant name, collector, collecting date, state).

3. RESULTS

In 2013 in nature we collected seeds of 59 target plant species (being already selected before for collecting) for the *Millennium Seed Bank* and 257 for our own Garden seed bank. From all the plant species we were able to collect seeds of three in Slovenia endemic species, thirteen statutorily protected species, eight vulnerable (VU) species, one rare species and one species with its conservation status not known enough. We carried out 50 days of field work in seeds collecting on 37 localities with additional 10 days needed for observation of phenological phases of species intended for seed collecting.

The seeds of selected plant species were collected in six different phytogeographical regions where the seeds of the majority of species were collected in the sub-Mediterranean phytogeographical region and seeds of the least species were collected in Alpine phytogeographical region. We started with seed collecting in May and finished the work in December of 2013. The seeds of the majority of species were collected in September and June. These were mostly late-spring blooming species in lower lying areas and early-spring blooming species in higher lying areas, where the snow cover in 2013 remained rather long. Seeds of the least number of species, mostly summer and autumn blooming, were collected in

November and December. We have been able to collect the seeds of some species from early summer till late autumn due to their after-blooming.

4. DISCUSSION

Contact of different biogeographical regions, varied climate conditions and past geoclimatical events in Slovenia region caused the occurrence of Illyrian, Alpine and sub-Mediterranean species. Exactly this species diversity and mixture of different floral elements was always an inspiration for Slovenian and foreign plant lovers. While among them Matthioli (1570) and Clusius (Petkovšek 1967) already were among the first who made the plant inventory of Slovenian country, Valvasor (1685) emphasized that the flora of Slovenia has to be presented to the wider European region. He has done this in his famous 18th volume of *Slava vojvodine Kranjske* (Glory of the Dutchy of Carniola). In the same way also later researchers of this region - like Scopoli (1760, 1772), Hacquet (Praprotnik 2003a), Wulfen (1858), Hladnik (ZAL), LJU 184), Fleischmann (1844) and others (Host 1827-1831, Freyer 1829, Pospichal 1897-1899) - aproched this subject. It is very interesting, that many plant data from older literature are nowadays still true, showing that the Slovenian nature is in quite good condition despite hundreds of years of development until today. The fact is that already more than hundred years ago, they wrote about nature conservation and nature protection. Fleischmann (Praprotnik 1993) already worked on afforestation of Karst. Paulin also started to work in the field of nature protection and already in 1906 wrote a study about botanical and natural monuments of Carniola, where the plants of Kredarica in Julian Alps are mentioned. In this work he states a need for protection of nine plants, seven of them being Alpine: *Leontopodium alpinum*, *Gentiana lutea*, *G. froelichii*, *Viola cornuta*, *V. zoysii*, *Eryngium alpinum*, *Geranium argenteum* (Mayer 1988). Here it has to be noted that edelweiss was protected in Carniola already in 1898 by the law for protection of edelweiss and king's flower in Carniolan mountains (Anonymous 1898). Paulin

also contributed to memorandum of department for nature protection and natural monuments (Bevk 1920). Fran Jesenko, geneticist and Paulin's successor as the Head of Botanic Garden was one of the initiators for establishment of Triglav National park (Kreft 1990).

Exactly the awareness about rich plant species diversity on our doorstep and about its protection stimulated us to participate in seed collecting for *Millenium Seed Bank* (MSB). Through this participation the species from Slovenia will also be safely stored for conservation purposes. The key factor for selecting target plant species, which seeds we wanted to contribute, was mainly its conservation status at local and global point. So we placed on target species plant list mainly those plants, which are especially important for Slovenia. Among them are surely plant species, with its *locus classicus* in Slovenia or endemic for this or wider region (Scopoli 1772, Host 1827- 1831, Mayer 1960, Wraber 1996). Based on various conventions these species should be especially protected near their origin. In University Botanic Gardens Ljubljana we do that since our beginnings, because the Garden was established as a "Garden of native flora". That means that mainly plants of Carniola (Slovenia) were represented here (Freyer 1829, Voss 1884, Paulin 1912, Lazar 1960, Strgar 1973, Bavcon 2000, 2010a, b) and also today works on a plants of native flora (Bavcon 2008a, 2009b, 2010 b, 2013; Bavcon et al 2012).

In year 2013 the weather conditions caused spring delay and consequently also delay in blooming as well as fruiting of many plant species. Because of the long winter with plenty of snow, we started to collect seeds not earlier than by the end of May. First seeds that we have collected were from the spring species *Leucojum vernalis*, wherein lots of fruits were eaten by snails. High precipitation during whole spring caused the expansion of snail populations that ate away spring snowflake fruits. However, many spring-flowering plants did not have seeds at all, because in the time of blooming either the temperatures were too low for most of the pollinators, or precipitations were frequent and the number of present pollinators

was too low. Some seed collecting problems were, of course, connected with the local microclimate, vegetative plant characteristic and local environmental management, which also affects some plant species. Next follows the presentation of some important plant species in Slovenian flora, which seeds we have collected, in connection with environment description where this species can be found, its conservation status and troubles or our observations that we had during seed collecting.

As already mentioned before, we started to collect seeds by the end of May, 2013. Mainly we collected seeds of early and late spring species. Just not far away from the capital city Ljubljana, at Ljubljana moor, we collected seeds of species that are growing in wet and semi-wet habitats. Nature Park Ljubljana moor is the most southern lying lowland raised bog which originated through the sinking of bedrock. Since its beginnings it was always inhabited. Later in history many times they tended to systematically dry out the Ljubljana moor and turn it to the agricultural surfaces (Melik 1946). However with the peat cutting in 200 years they literally burned it (Peterlin 1971). Subsequently, due to the all abovementioned interventions different plant and animal species became endangered. Some habitat types almost disappeared. With the establishment of Nature Park and placing it in Natura 2000, the impoverishment of Ljubljana moor is at least a little bit smaller. Despite that nowadays natural localities of some moor plant species in lowland have unfortunately disappeared. So here and there only wet and occasionally moorish grasslands still remained (Geister & Tome 1995). Some plants have already adapted to the new conditions because of constantly drying out the moor. But there is still a danger that they will disappear because of intensive land management (Tome et al. 2000), early mowing and bale making. So moor areas are changing very fast. The example of changing areas on Ljubljana moor are wet grasslands where *Fritillaria meleagris* (Snake's head) is growing and some others bog plant species (*Caltha palustris*, *Parnassia palustris*, *Orchis palustris*, *Dactylorhiza incarnata*). Their natural sites are changing very fast because of intensive ag-



Fritillaria meleagris near Ljubljana

riculture and change in land use (urbanization) (Bavcon 2010a). Graf (1834) has written about massive blooming of Snake's head (Predin 1997). But today we can find just here and there some spots with larger populations. In various areas the Snake's head is not fruiting anymore because of the early spring mowing. That means that the plants are reproducing only vegetative, with bulb division. Another problem is fertilizing of agricultural land that also is not suitable for many bog plant species. The effect of meadow overgrowing is a problem where some of typical grassland species also disappear (Bavcon 2013). Similar problem occurs in areas with too early pasture, as the plants are not able to finish their blooming. Only the traditional way of agriculture, like reduced fertilizing, enables us with the protection and conservation possibilities for Ljubljana moor (Bavcon 2013). Agricultural land should be fertilized only with barn manure for couple of years in combination with late mowing, for *F. meleagris* that means in June. Its seeds are mostly ripe until 15th of May, in wet years somewhere not until the

beginning of June. Another possible way is crop rotation. Every year some surfaces should be managed traditionally and after that they could be used for bale-making again (Rustja 1929, Bavcon 2013).

Another late spring species is *Scopolia carniolica* (Carniolan scopolia), which yellow flowered form, Hladnik's scopolia (*Scopolia carniolica* Jacq. f. *hladnikiana* (Biatz. & Fleischm.) E. Mayer) is very important for Slovenian flora. This yellow form is known since 1819, when it was found in surroundings of Turjak by Franc Hladnik. Since that time it is still growing in the University Botanic Gardens Ljubljana. Alfonz Paulin (1853-1942) looked for it in vain on locations around Turjak and in Želimplje. He said that the Hladnik's scopolia is very rare. That is why in dried plant collection *Flora Exiccata Carniolica (1901-1936)* the plant from Botanic garden was collected and stored (Wraber 2008). Therefore, these are the offsprings of the plants brought to the Garden in Hladnik's time (1819) (Lazar 1960, Strgar 1973). In modern time the *S. carniolica* f. *hladnikiana* was discovered also on some other locations in Slovenia (Dakskobler 1995), but there are no reports about natural sites of its yellow variety. Because of the unforeseeable weather conditions, unexpected cold spells and late snowing, we could not find any flowering specimens. Therefore we could not mark the yellow-flowering populations and separate them from original brown-flowered specimens. But also on location where only Hladnik's scopolia is present we could not find any seeds. That indicates very poor pollination because of bad weather conditions. Yet at higher lying localities, where the plant is blooming later in spring, we collected seeds of original species, *S. carniolica*.

Besides collecting seeds of some spring species, one of the first species, which seeds we have collected, was *Cortusa matthioli*. Most known species locality is small location in Huda luknja Valley (Wraber 1990b), but here the population is really small in number and also hardly accessible. So we checked another possible location in the woods on Uršlja gora. At that locality the species is very

numerous in big populations on some different sites on rock walls covered with vegetation in the larch forest and on its edge. Despite big population there were just few fruiting plants. The reason is probably in absence of pollinators in rainy spring season, what caused that it did not come to pollination and fertilization. Beside *C. matthioli* the important species among plants of that region are also alpine buttercup (*Ranunculus alpestris*), spurge-laurel (*Daphne laureola*), endemics *Nigritella lithopolitanica* and Zois bellflower (*Campanula zoysii*). For the last two species on Uršlja gora mountain chain there is their western border of distribution area.

The majority of plant seed, that we have collected, belongs to the grasslands species from varied grassland habitat types. Especially some of those species are, because of landscape management, agriculture, and climate change, under the population decline. For these species *in situ* and *ex situ* conservation has to be provided. For instance, species like *Gladiolus illyricus*, *Cirsium pannonicum* and *Linum viscosum* are *in situ* protected at dry meadow near Sava river. It is a surface of 2 ha, where University Botanic Gardens Ljubljana protects plant species *in situ* (Bavcon 2008b, 2010a). Near of its borders are intensively cultivated agricultural surfaces, so the meadow could represent a natural plant seed bank and could be a potential seed source and source of great biodiversity for other surrounding areas (Bavcon 2008b, 2010a). During first listings of grasslands plants on the meadow in Roje, they recorded more than 120 plant species (Bavcon & Marinček 2004). The species *G. illyricus* is really massively represented at this meadow but it is disappearing from some Karst grasslands where there is an intensive economical management. Despite the fact that this species can grow as well on dry as on wet meadows, it is subjected to two opposite trends: surface overgrowing and hasty mowing. In the shadow of trees and shrubs the species is slowly disappearing. Less than ten years ago on Planinsko polje and on some other places the surface was violet during *G. illyricus* bloom (Bavcon 2013). But today, the species is disappearing because of hasty mowing every year. Sometimes in some wet years, like the



Porezen



Eryngium alpinum on a slope in Porezen



Eryngium alpinum eaten by sheeps



Eryngium alpinum

spring of 2013, there are no possibilities for early mowing, because the soil is too soggy and heavy machines cannot drive on it, still can be found somewhere. But anyway already in spring there are some dry periods, so that is why we should be concerned about this species. Fatal for this species also is intensive fertilization. For the other two species (*C. pannonicum* and *L. viscosum*) the same problem represents overgrowing, early and intense mowing. *Cirsium pannonicum* is a typical species of grasslands, which has to be late mowed, in the old, traditional way. In the opposite, the species can quickly disappear, because it does not make seeds any more. On intensively propagated surfaces the species is not present anymore. As late mowing nowadays is more an exception, the species existence is in great danger (Bavcon 2008b, 2010a, b, 2013).

The overgrowing effect can also be the reason for decrease in specimen's number of Pannonian gentian (*Gentiana pannonica*). This plant has its *locus classicus* on the Porezen hill, where it was discovered by Scopoli (1772). It grows on a steep slope with south exposition. The bedrock is Jurassic clay slates, on which acid brown soil has developed. Prevailing community here is *Festuco-Agrosteum*, conditioned by intense grazing. In the 1970-ies people started to abandon the pastures and in the 1980-ies the mowing stopped. The pasture was introduced at the beginning of 1990-ies once again, while only gently sloping surfaces are still mowed today. Consequently, all the steep slopes are overgrown and also the locality of *G. pannonica*. Its population is reducing for several years due to omission of mowing in the 1970-ies (Seljak 2002, Bavcon 2008b). However, the exaggerated pasture had even worse effect on its distribution, so the species populations still do not increase. On this place only 20 to 54 plants are flowering every year, but the entire population consists of maybe 100 specimens, while the same plants are not flowering every year. On this area it should be absolutely necessarily to stop grassland overgrowing and using occasional pasture to regulate the conditions in this population (Bavcon 2008b). The same is happening with Alpine



Gentiana pannonica

eryngo (*Eryngium alpinum*). It grows under the landslide area on the top of Porezen. Annual snow cover accumulates new supply of fresh organic material, what enables the growth of high perennials like aforementioned species (Seljak 1974, Dakskobler et al. 2005). In the 1980-ies it became very endangered species because of the abandoned pasture and surface overgrowing (Seljak 2002, Dakskobler 2004), although with new regular pasture restoration it is spreading again (Bavcon 2008b, Bavcon 2013). If areas will not be left to occasional pasture, the species will sooner or later be endangered. Nevertheless, the uncontrolled pasture could also be a reason that in some years, on renewed plant sites, full flowering specimens could not be found. This happened also in the year 2013 on Porezen, where sheep are pastured outside the fence and have eaten all flowers, even those which were in the secondary blooming. Great drought and high temperatures on southern slopes are causing the food deficiency for animals - that is why they are looking for food outside the fence. At first visit of locality in the middle of July it seemed that at least in some ditches there will

still be at least any untouched plants. But that did not happen. Even inflorescences already eaten before and where the plants created new ones, were also eaten by animals. The populations of Alpine eryngo in Slovenia are not numerous (Dakskobler et al. 2005) and most of them are also unstable. The secondary succession processes are the reasons of their reduction in number. The most stable populations are especially in communities of high herbs on rocky subalpine sites above the upper tree line (Dakskobler 2004, Dakskobler et al. 2005).

In Porezen neighbourhood we have to point out another important endemic plant species – Carniolan primrose (*Primula carniolica*), which seeds were also collected. This is the species which was already found by Scopoli in 1772, but he described it incorrectly. Yet Jacquin (1778) recognized it as a new species, described it and named it after former Carniola, nowadays Slovenia. It is the species which distribution is increasing in last decades (Wraber 1990b). Population numerosity is everywhere strong enough. Even pasture does not decrease its populations. On its natural site, which was discovered in the 1980-ies (Bavcon 1987, Bavcon & Terpin 1991), despite pasture, there are still plenty of plants. They disperse even lower as they were before. The natural site of Carniolan primrose is only in part of Notranjska region and on one site in Gorenjska (Žakej 1987). Its areal includes west sub-Alpine region and north edge of Dinaric mountain chain. Since those days until today the knowledge about its distribution became much greater, although the plant is still growing on quite a small area. Some new localities of Carniolan primrose moved its distribution range on the edge of sub-Alpine region. Today we can find the species very close to capitol city Ljubljana in Iški vintgar, Borovniški pekel and valley of Prušnica (Acceto 2008). Its natural growing sites are moist rocky places. Despite that it can also be found on meadows in Vojsko, on Jelenk, above Spodnja Idrija and at Rodne (Bavcon 1987, Bavcon & Terpin 1991).

In our *Index seminum* there are also always seeds of the single



Hladnikia pastinacifolia

Slovenian endemic genus, *Hladnikia pastinacifolia* (Mayer 1960, Wraber 1990a, b) from Trnovski gozd area. The specimens of this species are represented in different parts of Botanic garden or are in research collections (Bavcon 1998, 2008b, 2009a, b, 2010 a, b, 2013). Its distribution area is very small (Wraber 1990a, b) while it's areal does not expand. Its *locus classicus* is on Čaven at Trnovski gozd (Wraber 1990a, b, Wraber 2003). This is a plant of open and bright habitats which prefers hard ecological conditions on poorly developed ground. Most often it can be found on stony grasslands, in rock fissures, scree slopes and in gaps of black pine forest (Čušin 2004). Considering that the species is biannual, normally numerous populations can be found after few years (Bavcon 2008b). *Hladnikia* can be found at two different natural sites exposed to sun or in shady northern sites (Wraber 1990a, b, Bavcon 2008b, Bavcon 2013). Especially shady sites are those, where seed production is unimpeded. In the same area, where the seeds of *hladnikia* were collected, we also collected pretty high number of

different other species, as the plant diversity is really great because of different climate influences. This area is actually a transitive position between Dinaric and Alpine region. That can be seen in its vegetation and presence of some plant species. The influence of mid-Europaeen floral element is prevailing complemented by Illyrian and sub-Mediterranean-Illyrian floral element in warmer, lower and southern expositions. Sub-Alpine belt and cold hollows integrate also boreo-Alpine plant species. Unlike in the rest of high Karst region, some typical Illyrian species are very poorly represented here. We had to return on the area for many times, because last long winter caused almost one month delay in blooming time of some plant species. This has resulted also in delay in fruiting. A big problem in seed collecting in this area represents also a strong *bora* wind. As a consequence we had to do our field work just on right time, before strong winds had blown the seeds away.

In the beech forest in same area we also collected the seeds of black hellebore (*Veratrum nigrum*). After two years of dry conditions plants could fruit in forest much easily while in the years before they developed vegetative parts only. This species is typical for sunny meadows, thermophilic community of black hornbeam and manna ash and on gravel. In year 2012 despite drought the plant flowered on many sites. Especially on Slavnik the population of blooming plants was really numerous. But as the plant does not bloom so abundant every year, we searched unsuccessfully for it in a year 2013. However on shady sites at Čaven the plant flowered and fruited plentifully. Periodical abundant flowering in every few years is also known for yellow gentian (*Gentiana lutea*), pannonian gentian (*G. pannonica*) and for some other robust species. In two or three years between this abundant blooming the plant develops only leaf rosette and after that it blooms again. As elsewhere in Slovenia also here the areas of former pastures are overgrowing, threatening some plant species.

Although we wanted to collect the seeds of edelweiss (*Leontopodium alpinum*) at rocky and exposed slopes in Trnovski

gozd, we could not. Hardly any flowering or fruiting plants were seen, although there grows a quite big population. Drought in last couple of years and high temperatures on many sites thinned its local population. That is why we collected these seeds at the top of another Dinaric mountain chain, Snežnik. As the only mountain outside the Alps being so high, Snežnik has several interesting features in terms of its special flora. Illyrian and mid-European floral elements are interlacing there with Illyrian-sub-Mediterranean and Alpine floral elements. Snežnik namely is natural growing site of some rare species, while for some of them here it is the only known locality in Slovenia (*Asperula beckiana*, *Carex kitaibeliana*, *Cerastium dinaricum*, *Euphrasia hirtella*, *Festuca bosniaca*). Quite many species of forest vegetation growing here, being distributed between Southeast Alps and northwest Dinarids and being mostly tertiary relicts, are placed in the group of Illyricoid species (Wraber 1965, 1967, 1971, 1997; Zupančič et al. 2004). Right on rocky, almost bare mountain peak, among dwarf pine, we found quite numerous population of edelweiss. Nowadays the species is not anymore on the list of endangered plants, but is still statutorily protected since 1898 (Anonymous). Weather conditions have strong influence on its distribution outside Alpine area (Wraber 1990a, Kaligarič 1997a), whereas the most beautiful and plentiful fruited plants were found on Snežnik on bare ground, among dwarf pine and usually right next to dwarf pine, on meadows.

Another part of Slovenia very rich in plant biodiversity is its sub-Mediterranean part. There we mostly collected seeds of dry grasslands plant species, especially endangered, because of overgrowing and landscape management. This is the main reason why University Botanic Gardens Ljubljana collects plants at this area for many years and in last decade we intensively watch over some specific locations. In general in this region Mediterranean, Illyrian-Mediterranean, Illyrian-south-Europaeian floral elements are present (Wraber 1969). Besides those mentioned, we can find species with prevailing Eurasian, European, Eusibirian, mid-European, Atlantic and cosmopolitan distribution. Their portion is increasing with

distance from coast (Kaligarič in Seliškar 1999). The geoclimatical factors are the main reason for that kind of vegetation distribution. While the amount of precipitation increases from coast to continental parts, in the same direction the temperature is decreasing. Very important for the vegetation development is also the yearly distribution of precipitation. The amount of precipitation is the highest in spring and autumn, while summer droughts are quite common. Because of the limestone bedrock, which is water permeable and can warm up really quickly, the draughts are even stronger. In combination with draught, the plants are dried up because of the strong *bora* wind. For this reason in summer the grass vegetation in some places can be totally dried out (Kaligarič & Seliškar 1999). In past, most of the area was covered with forest - later on, the people thinned the forest for agricultural purposes. Various pastures, meadows, orchards, olive plantations and vineyards emerged. Still 150 years ago, Karst was almost like a stony desert. Later on, planned afforestation was started with black pine (*Pinus nigra*) (Culiberg 1999, Praprotnik 1993). For this reason today's vegetation is even more mosaically structured. Former pasture land, very rich in plant diversity, is mostly overgrown with *Carici humilis-Centaureetum rupestris* community, where we can find many other Mediterranean, mountain-Mediterranean, Illlyrian and mid-European species (Kaligarič 1997b).

Like on the plateau Nanos, where we collected seeds of *Gentiana lutea* subsp. *symphyandra*, Dinaric and sub-Mediterranean vegetation area are overlapping. Here we can find Illyrian, Alpine and Mediterranean species. On this area even endemic species, Marchesetti's bellflower (*Campanula marchesettii*) and Scopoli's rockcress (*Arabis scopoliana*) with its *locus classicus* right on Nanos, are growing (Scopoli 1772, Wraber 1990b). When collecting seeds of *G. pannonica*, we noticed that some plants did fruit very well but upper parts of plants were eaten by deer. Likewise, often the seed capsules and seeds were eaten by bugs. On the same location we also collected seeds of *Iris sibirica* subsp. *erirrhiza*, which Pospichal (1897-1899) has found on Kojnik and de-



Gentiana lutea subsp. *symphyandra*

scribed as new species. Actually, it is the subspecies of *Iris sibirica*. Because of its small areal it belongs to the endemic plants (Mayer 1960, Šilić 1984, Wraber 1996). Until now this species is not yet endangered, but with overgrowing of its natural growing sites the populations are going to be reduced. Pre-emptive actions could be an implementation of occasional pasture for some years in order the plants could recover in the meantime. Constant pasture can reduce its population. In 2013 the fruits of *Iris sibirica* subsp. *erirrhiza* were also quite often eaten by animals what could also be a consequence of extreme draught what in consequence leads to increased attack of various insects.

In year 2013 the effect of draught and grasslands overgrowing by seed collecting was present all the time. But anyway some species are also attached to transitional phase of overgrowing or are typical for the beginning phase of overgrowing. That kind of species is the white asphodel (*Asphodelus albus*). As long as this phase is



Asphodelus albus and *Narcissus poeticus* subsp. *radiiflorus*

just transitional, the plants will grow well, but when overgrowing becomes too intense, the species slowly vanishes. In nature, on late mowed areas it can be seen that the species is distributed very well. In overgrowing areas it is densifying until it is overgrown by bushes. It prefers pasture land as this is an early blooming species and at that time the pasture is not so intensive. In cases where there are many pasture surfaces and the pasture is not too intensive, that does not harm the plants. These grasslands on the hill tops and plateaus are under very fast overgrowing process, after pasture abandonment. Wherein typically for the first phase of overgrowing is the population of *Laserpitium siler*. It is true, that this species is slowing down the overgrowing, but nevertheless when the surfaces are overgrown with bushes, this species slowly disappears. Nowadays in many places *L. siler* is a prevailing species. So we did not collect seeds only on the meadows but also on the site where beginning phase of overgrowing can be noticed, and on the forest edge.



Ligusticum seguieri

At Podgorski Kras grasslands are overgrowing with bushes of *Juniperus communis*, *Crataegus monogyna*, *Fraxinus ornus*, *Ostrya carpinifolia* and *Sorbus aria*. The common juniper (*Juniperus communis*) is a species which is increasing because of overgrowing on Karst meadows and inland grasslands (Zupančič 1999). While the overgrowing in Slovenia inland is faster, there the juniper is not a compatible species, because it prefers open areas (Šilić 1983, Kotar & Brus 1999, Bavcon 2013). In the opposite, the overgrowing on Karst is slower because of the water deficit. Still grasslands with juniper are only a transitional phase. When trees prevail, the juniper quickly disappears. Despite the fact that juniper is a very drought tolerant species, it could totally dry out. That we have seen during our field work also in year 2013. On many locations in sub-Mediterranean area we've seen dry juniper bushes.

The Karst plateaus are really beautiful when, at the late spring, the

common peony (*Paeonia officinalis* subsp. *officinalis*) is in bloom. With its beauty it definitely raises attention; however we have also noticed that some specimens in year 2013 either did not fruit or they were eaten by animals. Both probably are a consequence of drought in summer months. Although this species is in Slovenia relatively abundant, its natural sites are changing because of the overgrowing and land use management, so at many places only green parts of plants can be seen. Actually many times they are seen just in their vegetative phase and hardly ever in their blooming phase. Luckily, the overgrowing in this area is less intensive due to low precipitation (ARSO 2013) and so the peonies are not yet endangered. With a new restoration of pasture on some parts, their areal will not be totally reduced in the future. If the surface is lightened enough overgrowing does not affect the populations too much. Those kinds of places are the peony's natural sites on stony Karst ground. At least 15 years of regular monitoring of these natural sites shows, that on the lowest and less exposed sites the overgrowing is faster, even though the terrain here is rockier as in the higher and more wind-exposed places. The sinkholes on the plateau act like centres of overgrowing, but because of the cold air at the bottom, the overgrowing also here is a little bit slower.

A special island of a small "island" of the true eu-Mediterranean vegetation – *macchia*, grows above village Osp on Karst edge. There is possibility to collect seeds from Mediterranean plants, like *Laurus nobilis*, *Phyllirea latifolia*, *Quercus ilex*, *Rosa sempervirens*, *Rubia peregrina* etc. In rocky fissures following species can be found: *Hyssopus officinalis*, *Teucrium flavum*, *Cephalaria leucantha* and *Daphne alpina*. Among important representatives definitely is a local endemic species, *Moehringia tommasinii* (Kaligarič 1997b). In undergrowth of the thermophilic shrubs thrives *Ruscus aculeatus*, that some decades ago was protected at Goriška region (Skoberne 1983). Although this species is extremely drought tolerant, a long lasting drought still can harm it. For this reason in 2012 some bushes of *Ruscus aculeatus* totally dried out (Bavcon & Makše 2013). Young buds are often eaten by animals while older

plants ceased to be attractive. Today this species is expanding and at the same time often represents also the beginning of overgrowing of pastures and mowing areas. On dry pastures and meadows above Osp a good distribution of savory can be observed, as described by Šilić (1984). In lower areas winter savory (*Satureja montana*) is present while on the top of the plain this is being replaced by liburnian savory (*Satureja subspicata* subsp. *liburnica*). In the transitional zone, where both taxa are present, often occurs their hybrid, listed as Slovenian endemic (Wraber 1996). Due to this fact we never collected the seeds in the boundary areas of both species, as the presence of hybrids there was more probable. In the fruiting state such a hybrid, especially in nature, is hard, if not even impossible, to distinguish from the original species.

Long winter and rainy spring in 2013 have significantly postponed the beginning of vegetation season meaning that some seed collecting localities had to be visited for several times. Based on ob-



Box of collected seeds

servations of blooming and fruiting during recent years in this year we often visited the localities almost one month too early for seeds collecting. Still we tried to collect as many seeds as required by standards of *Millennium Seed Bank*. Because of this, and to increase the genetic variability, we collected seeds from populations growing on different localities. Nevertheless it is worth mentioning that we successfully have collected seeds of Slovenian endemics and protected plant species.



Cirsium pannonicum



Pulsatilla montana



Pulsatilla nigricans



Papaver rhoeas



Dry meadows in Slovenian Istra



Veratrum lobelianum subsp. *lobelianum*



Inula hirta



Echinops ritro subsp. *ruthenicus*

LITERATURE

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Index seminum annis 2013 et 2012 collectorum

Jože Bavcon & Janja Makše

Abstract

The 2013 Index seminum includes the seeds of 744 species collected in the University Botanic Gardens Ljubljana. All are arranged per families and these are listed in alphabetic order. The alphabetic principles is followed also in listing species within families. The indeex of the seeds harvested in nature contain 245 units. The total number of units from the year 's Index amounts 880.

Key words: Index seminum, annis 2013 et 2012 collectorum

Material and methods

Seeds begin to be harvested from the garden plants at the end of April or beginning of May, depending on weather conditions. From then on single species in various parts of the Garden are regularly monitored and their seeds collected in due course. Each species is assigned a suitable label stating the date of harvesting and the name. The seeds of the same species are harvested several times as they mature, more than one bag of seeds of the same species is collected. We try to observe the rule to have minimally five plants of the same species in the Garden. The seeds are then left to dry in a dry room. They are dried with regard to their specific nature. Juicy fruit seeds are spread apart and arranged over newspaper sheets. The seeds requiring constant moisture are stored in fine sand immediately after harvesting.

The harvesting of seeds in nature likewise starts in spring and lasts till autumn and even winter. Seeds are collected in different parts of Slovenia. We always take care to remove them from a larger

number of specimens, from five specimens of a species in the same habitat. Seeds from a particular habitat are stored in one bag. The habitat and the species, if already known, are put down; if the species is not identified, the whole plant is removed and the species subsequently determined in the Botanic Garden. The non-determined species are photographed on their growing site: plant as a whole and single details, flower, leaves. The bags used to store seeds are either made of paper or plastic material, the only difference being that the seeds are moved from plastic into paper bags if they are not properly dry yet.

Immediately after being brought to the Garden all seeds collected in nature are examined, the non-determined species are determined according to the keys as known from literature or by comparing them with the collection of seed samples. Otherwise the bags are merely left open and put in a dry and naturally aired place. During winter the seeds are cleansed, determinations are re-examined, this time also by using the seed determination keys, and finally by comparing them with the reference collection.

Harvesting seeds in nature is an exacting task. One has to be familiar with the time single plants form mature seeds because some fall off very quickly, so it is difficult to get them at exactly the right moment. A particularly powerful factor in Slovenian Istria, Goriško and Vipavsko is the strong wind typical of those parts of Slovenia. It is essential to be familiar with the habitats of single plant species because numerous plants are well recognizable and visible during their blossoming period whereas they are later overgrown with other plants and are much harder to find and in consequence also more difficult to determine. It is therefore best to visit single habitats several times a year, which makes the harvesting easier and more reliable.

Index seminum annis 2013 et 2012 collectorum

Jože Bavcon & Janja Makše

CONIFEROPHYTINA (Gymnospermae)

Ginkgoaceae

1. *Ginkgo biloba* L.

Pinaceae

2. *Pinus mugo* Turra

3. *Tsuga canadensis* (L.) Carriere

Taxaceae

4. *Taxus baccata* L.

Taxodiaceae

5. *Cryptomeria japonica* D. Don

6. *Metasequoia glyptostroboides* Hu & Cheng

MAGNOLIOPHYTINA (Angiospermae)

Acanthaceae

7. *Acanthus balcanicus* Heywood & I.B.K. Richardson

Aceraceae

8. *Acer ginnala* Maxim.

9. *Acer griseum* (Franch.) Pax.

10. *Acer tataricum* L.

Actinidiaceae

11. *Actinidia melanandra* Franch.

Alismataceae

12. *Alisma plantago-aquatica* L.

Alliaceae

13. *Allium angulosum* L.
14. *Allium ericetorum* Thore
15. *Allium schoenoprasum* L. subsp. *alpinum* (DC.) Čelak 2012
16. *Allium senescens* L.
17. *Allium sphaerocephalon* L.
18. *Allium tuberosum* Roxb.
19. *Allium ursinum* L.

Amaranthaceae

20. *Froelichia gracilis* Moq.
21. *Gomphrena globosa* L.

Amaryllidaceae

22. *Galanthus nivalis* L.
23. *Leucojum vernum* L.

Anacardiaceae

24. *Rhus verniciflua* Stokes
25. *Rhus vernix* L.

Apiaceae

26. *Astrantia carniolica* Jacq.
27. *Astrantia major* L.
28. *Athamanta haynaldii* Borb. & Uechtr.
29. *Cnidium silaifolium* Fiori. & Paol.
30. *Coriandrum sativum* L.
31. *Daucus carota* L. 2012
32. *Eryngium amethystinum* L.
33. *Eryngium bromeliifolium* Delar.
34. *Eryngium campestre* L.
35. *Eryngium giganteum* Bieb.
36. *Eryngium planum* L. 2012
37. *Hacquetia epipactis* (Scop.) DC.
38. *Hladnikia pastinacifolia* Rchb.
39. *Libanotis sibirica* (L.) C. A. Mey
40. *Libanotis sibirica* (L.) C. A. Mey subsp. *pyrenaica* (L.) O. Schwarz
41. *Pastinaca sativa* L. var. *fleischmanni* (Hladnik) Burnat
42. *Peucedanum officinale* L.
43. *Peucedanum schottii* Besser ex DC.

44. *Scandix pecten-veneris* L. 2012

45. *Smyrniium perfoliatum* L.

Apocynaceae

46. *Amsonia tabernaemontana* Walt.

Aquifoliaceae

47. *Ilex aquifolium* L.

Araceae

48. *Arum italicum* Mill.

49. *Calla palustris* L.

Araliaceae

50. *Acanthopanax sieboldianus* Mak.

51. *Hedera helix* L.

Arecaceae

* 52. *Livinstonia australis* Mart.

Asclepiadaceae

53. *Asclepias syriaca* L.

54. *Vincetoxicum fuscatum* (Hornem.) Reichenb.

55. *Vincetoxicum hirsutinaria* Medik.

Asparagaceae

* 56. *Asparagus sprengeri* Regel.

Asphodelaceae

57. *Asphodeline liburnica* (Scop.) Rchb.

58. *Asphodeline lutea* (L.) Rchb. 2012

59. *Asphodelus albus* Mill. 2012

Asteraceae

60. *Ageratum houstonianum* Mill. 2012

61. *Anthemis tinctoria* L.

62. *Artemisia alba* Turra

63. *Aster alpinus* L.

64. *Aster amellus* L.

65. *Bidens tripartita* L.

66. *Buphthalmum salicifolium* L.
67. *Calendula officinalis* L.
68. *Carduus nutans* L.
69. *Carlina vulgaris* L. subsp. *brevibracteata* (Andrae) K.Werner
70. *Catananche caerulea* Lindl.
71. *Centaurea cyanus* L.
72. *Centaurea rhenana* Boreau
73. *Centaurea scabiosa* L. subsp. *fritschii* (Hayek) Hayek
74. *Cirsium acaule* Scop.
75. *Cirsium eriophorum* (L.) Scop.
76. *Cirsium palustre* (L.) Scop. 2012
77. *Coreopsis grandiflora* Hogg.
78. *Coreopsis verticillata* L.
79. *Cosmos bipinnatus* L. 2012
80. *Cosmos sulphureus* Cav.
81. *Echinacea purpurea* Moench
82. *Echinops exaltatus* Schrader
83. *Echinops sphaerocephalus* L. 2012
84. *Eupatorium purpureum* L.
85. *Gaillardia aristata* Pursh 2012
86. *Gaillardia pulchella* Foug.
87. *Gynura cernua* Benth.
88. *Inula magnifica* L.
89. *Liatris graminifolia* (Walt.) Willd.
90. *Matricaria perforata* Merat
91. *Ptilostemon afer* (Jacq.) Geuter
92. *Pulicaria dysenterica* (L.) Bernh.
93. *Senecio sylvaticus* L.
94. *Serratula lycopifolia* (Vill.) A.Kern.
95. *Silphium integrifolium* Michx.
96. *Silphium perfoliatum* L.
97. *Silybum marianum* (L.) Gaertner
98. *Solidago graminifolia* (L.) Salisb.
99. *Tagetes erecta* L.
100. *Tagetes patula* L. 2012
101. *Tagetes tenuifolia* Cav. 2012
102. *Tanacetum corymbosum* (L.) Schultz Bip. subsp. *clusii* (Fischer ex Reichenb.) Heywood
103. *Tanacetum vulgare* L.
104. *Telekia speciosa* (Schreb.) Baumg.

105. *Tithonia tagetiflora* Desf.

106. *Zinnia elegans* Jacq.

107. *Zinnia pauciflora* L.

Berberidaceae

108. *Gymnospermium scipetarum* Papparisto & Qosja ex E.Mayer & Pulević

Betulaceae

109. *Alnus glutinosa* (L.) Gaertner

110. *Betula platyphylla* Suk.

Boraginaceae

111. *Anchusa officinalis* L.

112. *Cerinthe minor* L.

113. *Echium vulgare* L.

114. *Solenanthus scardicus* Bornm.

115. *Symphytum officinale* L. 2012

Brassicaceae

116. *Alyssoides sinuatum* Medik.

117. *Alyssoides utriculata* (L.) Medicus

118. *Alyssum montanum* L.

119. *Alyssum montanum* L. subsp. *pluscanescens* (Raim. ex J.Baumg.) Trpin

120. *Alyssum ovirense* Kerner

121. *Alyssum petraeum* Ard.

122. *Arabis caucasica* Schlecht.

123. *Barbarea vulgaris* R. Br. 2012

124. *Berteroa incana* (L.) DC.

125. *Bunias orientalis* L.

126. *Cardamine bulbifera* (L.) Crantz

127. *Fibigia clypeata* (L.) Medicus

128. *Fibigia triquetra* (DC.) Boiss.

129. *Isatis tinctoria* L.

130. *Lepidium sativum* L.

131. *Lunaria annua* L.

132. *Lunaria rediviva* L.

133. *Peltaria alliacea* Jacq. 2012

134. *Sisymbrium austriacum* Jacq.

Bromeliaceae

* 135. *Puya mirabilis* (Mez) L.B.Sm.

Butomaceae

136. *Butomus umbellatus* L.

Buxaceae

137. *Buxus sempervirens* L.

138. *Sarcococca saligna* Müll. Arg.

Cactaceae

* 139. *Harrisia bonplandii* (Parmentier)

Caesalpiniaceae

140. *Gleditsia triacanthos* L.

Calycanthaceae

141. *Sinocalycanthus chinensis* Cheng & S.Y.Chang

Campanulaceae

142. *Campanula barbata* L.

143. *Campanula justiniana* Witasek

144. *Campanula patula* L.

145. *Campanula persicifolia* L.

146. *Campanula poscharskyana* Degen

147. *Campanula pyramidalis* L.

148. *Campanula rapunculoides* L.

149. *Campanula thyrsoides* L.

150. *Campanula trachelium* L. 2012

151. *Edraianthus graminifolius* (L.) DC.

152. *Edraianthus tenuifolius* A. DC.

153. *Lobelia siphilitica* L.

154. *Symphyandra hofmanni* Pant.

Capparidaceae

155. *Polanisia graveolens* Raf. 2012

Caprifoliaceae

156. *Lonicera maackii* (Rupr.) Maxim.

Carpinaceae

157. *Carpinus betulus* L.
158. *Carpinus orientalis* Mill.

Caryophyllaceae

159. *Agrostemma githago* L.
160. *Cerastium arvense* L. 2012
161. *Cerastium carinthiacum* Vest. (Kunz) Kunz
162. *Cerastium grandiflorum* Waldst. & Kit. 2012
163. *Cerastium tomentosum* L. 2012
164. *Dianthus armeria* L.
165. *Dianthus barbatus* L.
166. *Dianthus deltoides* L. 2012
167. *Dianthus diffusus* Sibth. & Sm.
168. *Dianthus fragrans* M. Bieb.
169. *Dianthus giganteus* D'uru
170. *Dianthus graniticus* Jord.
171. *Dianthus monspessulanus* L.
172. *Dianthus sternbergii* Sieber
173. *Dianthus superbus* L. 2012
174. *Dianthus tergestinus* (Rchb.) Kerner
175. *Gypsophila scorzonerifolia* Ser.
176. *Lychnis coronaria* (L.) Desr.
177. *Lychnis flos-cuculi* L.
178. *Petrorhagia prolifera* (L.) P.W.Ball & Heyw.
179. *Petrorhagia saxifraga* (L.) Link
180. *Silene alpestris* Jacq.
181. *Silene gallica* L.
182. *Silene latifolia* Poiret
183. *Silene maritima* With. 2012
184. *Silene vulgaris* (Moench) Garcke
185. *Silene vulgaris* (Moench) Garcke subsp. *glareosa* (Jordan) Marsden-Jones & Turrill
186. *Viscaria vulgaris* Bernh.

Celastraceae

187. *Celastrus orbiculatus* Thunb.
188. *Euonymus europaeus* L.

Cercidiphyllaceae

189. *Cercidiphyllum japonicum* Sieb. & Zucc.

Chenopodiaceae

190. *Chenopodium bonus-henricus* L.

Cichoriaceae

191. *Crepis biennis* L. 2012

192. *Crepis foetida* L.

193. *Crepis pulchra* L.

194. *Crepis rubra* L.

195. *Hieracium aurantiacum* L.

196. *Hieracium glaucum* All.

197. *Hieracium lanatum* Vill. 2012

198. *Hieracium pilosella* L.

199. *Lapsana communis* L.

200. *Leontodon hispidus* L. subsp. *brumatii* (Rchb.) T. Wraber

201. *Leontodon hispidus* L. subsp. *danubialis* (Jacq.) Simonkai

202. *Tragopogon balcanicus* Velen.

203. *Tragopogon pratensis* L.

204. *Tragopogon pratensis* L. subsp. *orientalis* (L.) Čelak

205. *Tragopogon pterodes* Pančić

Cistaceae

206. *Helianthemum nummularium* (L.) Mill.

Convallariaceae

207. *Convallaria majalis* L.

208. *Danaë racemosa* (L.) Medicus

209. *Polygonatum latifolium* (Jacq.) Desf.

Convolvulaceae

210. *Ipomoea purpurea* (L.) Roh.

Cornaceae

211. *Cornus mas* L.

212. *Cornus sanguinea* L. subsp. *australis* (C. A. Meyer) Jav.

213. *Davidia involucrata* Baill.

Crassulaceae

214. *Sedum maximum* Suter

215. *Sempervivum montanum* L.

Cucurbitaceae

216. *Bryonia dioica* Jacq.
217. *Ecballium elaterium* (L.) Rich.

Cyperaceae

218. *Carex limosa* L.
219. *Scirpus sylvaticus* L.

Datisceae

220. *Datisca cannabina* L.

Dioscoreaceae

221. *Dioscorea balcanica* Košanin
222. *Dioscorea batatas* Decne.

Dipsacaceae

223. *Cephalaria gigantea* (Ledeb.) Bobrov
224. *Cephalaria leucantha* (L.) Roemer & Schultes
225. *Dipsacus fullonum* L.
226. *Dipsacus laciniatus* L. 2012
227. *Dipsacus pilosus* L.
228. *Dipsacus strigosus* Willd. ex Roem & Schult 2012
229. *Scabiosa hladnikiana* Host.
230. *Scabiosa lucida* Vill.
231. *Succisa pratensis* Moench

Elaeagnaceae

232. *Elaeagnus multiflora* Thunb.

Euphorbiaceae

- * 233. *Manihot palmata* Muell.
234. *Ricinus communis* L.

Fabaceae

235. *Anthyllis vulneraria* L.
236. *Astragalus falcatus* Lam.
237. *Desmodium canadense* (L.) DC.
238. *Dorycnium herbaceum* Vill. 2012
239. *Glycine max* (L.) Merr. 'Lutea'
240. *Glycine max* (L.) Merr. 'Nigra'

- 241. *Glycyrrhiza glabra* L.
- 242. *Hippocrepis comosa* L.
- 243. *Indigofera gerardiana* R. Grah.
- 244. *Laburnum alpinum* (Mill.) Presl.
- 245. *Laburnum anagyroides* Medik
- 246. *Lupinus polyphyllus* Lindl.
- 247. *Medicago lupulina* L.
- 248. *Medicago sativa* L.
- 249. *Melilotus albus* Medik. 2012
- 250. *Melilotus altissimus* Thuill.
- 251. *Phaseolus aureus* Roxbg.
- 252. *Phaseolus mungo* L.
- 253. *Phaseolus vulgaris* L.
- 254. *Trigonella gladiata* Stev. 2012

Fagaceae

- 255. *Fagus sylvatica* L.

Fumariaceae

- 256. *Corydalis cava* (L.) Schweigg. & Körte
- 257. *Corydalis lutea* (L.) DC.

Gentianaceae

- 258. *Centaurium erythraea* Rafn

Geraniaceae

- 259. *Geranium macrorrhizum* L.
- 260. *Geranium phaeum* L.
- 261. *Geranium pratense* L.
- 262. *Geranium robertianum* L.

Globulariaceae

- 263. *Globularia punctata* Hegetschw.

Hamamelidaceae

- 264. *Corylopsis spicata* Sieb. & Zucc.
- 265. *Hamamelis japonica* Sieb. & Zucc. 2012
- 266. *Hamamelis mollis* Oliv.
- 267. *Hamamelis virginiana* L.

Hyacinthaceae

268. *Bellevalia romana* (L.) Reichenb. 2012
* 269. *Bowiea volubilis* Harv.
270. *Muscari comosum* (L.) Miller
271. *Muscari neglectum* Guss. ex Ten.
272. *Ornithogalum sphaerocarpum* A. Kerner 2012
273. *Prospero elisae* Speta

Hydrophyllaceae

274. *Nemophila maculata* Lindl.
275. *Phacelia tanacetifolia* Benth. 2012

Hypericaceae

276. *Hypericum kalmianum* L.
277. *Hypericum olympicum* L.
278. *Hypericum perforatum* L.
279. *Hypericum tetrapterum* Fries

Iridaceae

280. *Crocus vernus* (L.) Hill subsp. *vernus*
281. *Gladiolus palustris* Gaudin
282. *Iris pontica* Zapal.
283. *Iris pseudacorus* L.
284. *Iris sibirica* L. subsp. *sibirica*

Juglandaceae

285. *Carya ovata* Koch
286. *Pterocarya fraxinifolia* (Lam.) Spach.

Lamiaceae

287. *Ballota rupestris* (Biv.) Vis.
288. *Betonica alopecuroides* L.
289. *Betonica officinalis* L.
290. *Betonica officinalis* L. subsp. *serotina* (Host) Hayek
291. *Clinopodium vulgare* L.
292. *Horminum pyrenaicum* L.
293. *Lavandula angustifolia* Mill.
294. *Leonurus cardiaca* L.
295. *Lycopus europaeus* L.
296. *Majorana hortensis* L.

297. *Melissa officinalis* L.
298. *Mentha aquatica* L.
299. *Mentha pulegium* L.
300. *Micromeria dalmatica* Benth 2012
301. *Micromeria thymifolia* (Scop.) Fritsch 2012
302. *Monarda fistulosa* L.
303. *Nepeta grandiflora* Bieb.
304. *Ocimum basilicum* L.
305. *Origanum vulgare* L. subsp. *viridulum* (Martrin-Donos) Nyman
306. *Phlomis tuberosa* L.
307. *Salvia glutinosa* L.
308. *Salvia officinalis* L.
309. *Salvia sclarea* L.
310. *Salvia verticillata* L. 2012
311. *Satureja montana* L. subsp. *variegata* (Host.) P.W.Ball
312. *Scutellaria alpina* L.
313. *Scutellaria altissima* L.
314. *Sideritis hyssopifolia* L.
315. *Stachys germanica* L.
316. *Teucrium arduini* L.
317. *Teucrium chamaedrys* L.
318. *Teucrium hircanicum* L.

Liliaceae

319. *Hosta ventricosa* (Salisb.) Stearn
320. *Lilium bulbiferum* L. subsp. *croceum* (Chaix) Baker

Linaceae

321. *Linum usitatissimum* L.

Lythraceae

322. *Cuphea procumbens* Cav.
323. *Lythrum salicaria* L.

Magnoliaceae

- * 324. *Magnolia champaca* (L.) Figlar

Malvaceae

325. *Abutilon theophrasti* Medik. 2012
326. *Althaea armeniaca* Ten.

327. *Althaea officinalis* L. 2012
* 328. *Gossypium arboreum* L.
* 329. *Gossypium hirsutum* L. 2012
* 330. *Hibiscus esculentus* L. 2012
331. *Hibiscus moscheutos* L. var. *roseus*
332. *Hibiscus trionum* L.
333. *Malva sylvestris* L. 2012

Martyniaceae

- * 334. *Proboscidea louisianica* (Mill.) Thell. 2012

Meliaceae

- * 335. *Melia azedarach* L.

Mimosaceae

- * 336. *Mimosa pudica* L.

Moraceae

337. *Maclura pomifera* (Raf.) Schneid.

Musaceae

- * 338. *Musa basjoo* Sieb. & Zucc.

Myrtaceae

- * 339. *Psidium cattleianum* Sabine

Nyctaginaceae

340. *Mirabilis jalapa* L.
341. *Oxybaphus floribundus* Choisy

Oleaceae

342. *Syringa villosa* Vahl.

Onagraceae

343. *Clarkia amoena* Lilja
344. *Epilobium hirsutum* L.
345. *Gaura biennis* L.
346. *Lopezia racemosa* Cav.
347. *Oenothera biennis* L.

Paeoniaceae

- 348. *Paeonia lactiflora* Pall.
- 349. *Paeonia officinalis* L.
- 350. *Paeonia romanica* Brandz.
- 351. *Paeonia wittmanniana* Hartw.

Papaveraceae

- 352. *Argemone alba* Lestib.
- 353. *Argemone mexicana* L. 2012
- 354. *Chelidonium majus* L.
- 355. *Glaucium flavum* Crantz
- 356. *Papaver rhoeas* L.

Passifloraceae

- * 357. *Passiflora edulis* Sims
- * 358. *Passiflora suberosa* L.

Pedaliaceae

- * 359. *Sesamum indicum* L.

Phytolaccaceae

- * 360. *Rivina humilis* L.

Plantaginaceae

- 361. *Plantago coronopus* L.
- 362. *Plantago holosteum* Scop.
- 363. *Plantago major* L. subsp. *intermedia* (Godr.) Lange

Plumbaginaceae

- 364. *Limonium latifolium* (Sm.) O.Kuntze

Poaceae

- 365. *Andropogon gerardii* Vitman
- 366. *Coix lacryma-jobi* L.
- 367. *Holcus lanatus* L.
- 368. *Holcus mollis* L.
- 369. *Leersia oryzoides* (L.) Swartz
- 370. *Melica ciliata* L.
- 371. *Molinia caerulea* (L.) Moench subsp. *caerulea*
- 372. *Sesleria autumnalis* F. W. Schultz

- 373. *Setaria verticillata* (L.) P.Beauv 2012
- 374. *Sorghum bicolor* (L.) Moench 2012
- 375. *Sorghum halepense* (L.) Pers.
- 376. *Sorghum vulgare* Pers. 2012
- 377. *Sorghum vulgare* var. *sudanense* Hitch. 2012
- 378. *Triticum spelta* L.

Polemoniaceae

- 379. *Gilia tricolor* Benth. 2012
- 380. *Phlox paniculata* L.

Polygonaceae

- 381. *Fagopyrum esculentum* Moench.
- 382. *Fagopyrum tataricum* (L.) Gaertner 2012
- 383. *Rumex salicifolius* Weinm.

Portulacaceae

- 384. *Portulaca grandiflora* Hook. 2012
- 385. *Portulaca oleracea* L. subsp. *oleracea* 2012

Primulaceae

- 386. *Primula columnae* Ten. 2012
- 387. *Primula veris* L.

Ranunculaceae

- 388. *Aconitum lycoctonum* L. em Koelle subsp. *lycoctonum*
- 389. *Anemone hupehensis* Lemoine
- 390. *Anemone ranunculoides* L.
- 391. *Anemone sylvestris* L.
- 392. *Aquilegia atrata* Koch 2012
- 393. *Aquilegia einseleana* F.W.Schultz
- 394. *Aquilegia grata* Zimmeter
- 395. *Caltha palustris* L.
- 396. *Clematis recta* L.
- 397. *Consolida regalis* S.F. Gray
- 398. *Eranthis hyemalis* (L.) Salisb.
- 399. *Helleborus atrorubens* Waldst. & Kit.
- 400. *Helleborus multifidus* Vis.
- 401. *Hepatica nobilis* Mill.
- 402. *Isopyrum thalictroides* L.

- 403. *Nigella damascena* L.
- 404. *Pulsatilla halleri* (All.) Willd. subsp. *slavica* (G. Reuss) Zamels
- 405. *Pulsatilla montana* (Hoppe) Rchb. 2012
- 406. *Ranunculus arvensis* L.
- 407. *Ranunculus millefoliatus* Vahl
- 408. *Thalictrum aquilegifolium* L.
- 409. *Thalictrum minus* L.

Rosaceae

- 410. *Agrimonia eupatoria* L.
- 411. *Agrimonia procera* Wallr.
- 412. *Aruncus dioicus* (Walter) Fernald
- 413. *Cotoneaster bullatus* Bois.
- 414. *Cotoneaster niger* (Thunb.) Fries
- 415. *Crataegus monogyna* Jacq.
- 416. *Crataegus pedicellata* Sarg.
- 417. *Duchesnea indica* (Andr.) Focke
- 418. *Filipendula ulmaria* (L.) Maxim.
- 419. *Fragaria vesca* L.
- 420. *Geum coccineum* Sibth. & Sm.
- 421. *Geum urbanum* L. 2012
- 422. *Potentilla nivea* L.
- 423. *Potentilla recta* L.
- 424. *Potentilla rupestris* L.
- 425. *Potentilla thuringiaca* Bernh. ex Link.
- 426. *Prunus tenella* Batsch
- 427. *Rhodotypos scandens* (Thunb.) Mak.
- 428. *Rosa glauca* Pourr.
- 429. *Rosa multiflora* Thunb.
- 430. *Rosa pendulina* L.
- 431. *Rosa rugosa* Thunb.
- 432. *Sanguisorba minor* Scop.
- 433. *Sanguisorba officinalis* L. 2012
- 434. *Sibiraea croatica* Degen
- 435. *Stephanandra tanakae* Franch. & Sav.
- 436. *Stranvaesia davidiana* Decne.

Rubiaceae

- 437. *Galium verum* L.
- * 438. *Psychotria bacteriophila* Valetton

Rutaceae

- 439. *Phellodendron amurense* Rupr.
- 440. *Poncirus trifoliata* (L.) Raf.
- 441. *Zanthoxylum simulans* Hance

Sambucaceae

- 442. *Viburnum lantana* L. 2012
- 443. *Viburnum sargentii* Koehne.

Saxifragaceae

- 444. *Heuchera americana* L.
- 445. *Saxifraga rotundifolia* L.

Scrophulariaceae

- 446. *Antirrhinum majus* L.
- 447. *Cymbalaria muralis* Gaertner, Meyer & Scherbius
- 448. *Digitalis ferruginea* L.
- 449. *Digitalis grandiflora* Miller
- 450. *Digitalis laevigata* Waldst. & Kit.
- 451. *Digitalis lanata* Ehrh.
- 452. *Erinus alpinus* L.
- 453. *Kickxia elatine* (L.) Dumort.
- 454. *Misopates orontium* (L.) Rafin.
- 455. *Penstemon alpinus* Torr.
- 456. *Penstemon fruticosus* (Pursh) Greene
- 457. *Penstemon hirsutus* (L.) Willd.
- 458. *Penstemon procerus* Douglas ex Graham
- 459. *Verbascum austriacum* Schott ex Roem. & Schult. 2012
- 460. *Verbascum blattaria* L.
- 461. *Verbascum densiflorum* Bertol.
- 462. *Verbascum nigrum* L.
- 463. *Veronica maritima* L.
- 464. *Veronicastrum sibirica* L.

Solanaceae

- 465. *Datura metel* L. 2012
- 466. *Datura metel* L. f. *inermis* 2012
- 467. *Datura stramonium* L.
- 468. *Lycium chinense* Mill.
- 469. *Nicandra physalodes* (L.) Gaertner

470. *Nicotiana rustica* L. 2012
471. *Nicotiana tabacum* L. 2012
472. *Nicotiana tabacum* L. var. *havanensis* 2012
473. *Nicotiana viscosa* Lehm. 2012
474. *Physalis ixocarpa* Brot.
475. *Scopolia carniolica* Jacq.
476. *Scopolia carniolica* Jacq. f. *hladnikiana* (Biatz. & Fleischm.) E. Mayer
477. *Solanum nigrum* L.
478. *Solanum sisymbriifolium* Lam. 2012

Staphyleaceae

479. *Staphylea pinnata* L.

Styracaceae

480. *Halesia carolina* L.

Taccaceae

- * 481. *Tacca chantrieri* André

Tiliaceae

482. *Tilia platyphyllos* Scop.

Tropaeolaceae

483. *Tropaeolum majus* L.

Ulmaceae

484. *Celtis occidentalis* L.
485. *Zelkova carpinifolia* (Pall.) K. Koch

Urticaceae

486. *Parietaria officinalis* L.
487. *Urtica dioica* L. 2012

Verbenaceae

488. *Callicarpa bodinieri* Levl. var. *giraldii* Rehd.
489. *Vitex agnus-castus* L.

Vitaceae

490. *Vitis sylvestris* Gmel.

* Semina plantarum in caladariis cultarum.

Horti praefectus: dr. Jože Bavcon

Seminum Curator, hortulana: Janja Makše

Semina e plantis spontaneis in loco natali annis 2013 et 2012 lecta

Jože Bavcon, Igor Dakskobler, Ljudmila Dakskobler, Branko Dolinar, Janja Makše, Blanka Ravnjak

491. *Achillea atrata* L. - Snežnik, 2013, J. B., B. R.
492. *Achillea distans* Waldst. & Kitt ex Wild. - Sveta Gora (Skalnica), 2013, L. & I. D.
493. *Actaea spicata* L. - Čaven, 2013, J. B., B. R.
494. *Adenostyles glabra* (Miller) DC. - Porezen, 2013, J. B., B. R.
495. *Adenostyles glabra* (Miller) DC. - Snežnik, 2013, J. B., B. R.
496. *Agrimonia eupatoria* L. - Žadovinec, 2013, J. B.
497. *Ajuga genevensis* L. - Slavnik, 2013, J. B.
498. *Allium sphaerocephalon* L. - Dragonja, 2013, J. B.
499. *Allium sphaerocephalon* L. - Vremščica, 2013, J. B., B. R.
500. *Anemone hortensis* L. - Dragonja, 2013, J. B.
501. *Anemone nemorosa* L. - Planina nad Vrhniko, 650 m, 2013, J. M.
502. *Angelica sylvestris* L. - Kolovrat (nad Dreko, Italija), 2013, L. & I. D.
503. *Antennaria dioica* (L.) Gaertner - Hrašenska planina (Karavanke), 2013, L. & I. D.
504. *Anthericum ramosum* L. - Podsreda, 2013, J. B., B. R.
505. *Anthyllis jacquinii* Kern. - Kucelj, 2013, J. B., B. R.
506. *Anthyllis montana* L. subsp. *jacquinii* A. Kern. - Nanos, 2013, L. & I. D.
507. *Anthyllis vulneraria* L. - Porezen, 2013, J. B., B. R., D. K., R. P.
508. *Aposeris foetida* (L.) Less. - Poljane pri Mirni Peči, 2013, J. M.
509. *Arabis pauciflora* (Grimm) - Porezen, 2013, J. B., B. R., D. K., R. P.
510. *Arabis turrata* L. - Močile (Anhovo), 2013, J. B.
511. *Arabis turrata* L. - Vojsko, 2013, J. B., B. R., A. M.
512. *Arthrocnemum macrostachyum* (Moris.) Moris - Koper, 2013, J. B., B. R.
513. *Asparagus tenuifolius* Lam. - Sočerga, 2013, J. B., B. R.
514. *Asphodelus albus* Mill. - Slavnik, 2012, J. B.
515. *Aster amellus* L. - Sočerga, 2013, J. B., B. R.
516. *Aster amellus* L. - Mrzli vrh, 2012, L. & I. D.
517. *Aster tripolium* L. - Ankaran, 2013, J. B., B. R.
518. *Astragalus carniolicus* Kern. - Kucelj, 2013, J. B., B. R.

519. *Athamanta turbith* (L.) Brot. p.p., em. Karsten - Rakitovec, 2013, J. B., B. R.
520. *Athamanta turbith* (L.) Brot. p.p., em. Karsten - Slavnik, 2013, J. B., B. R.
521. *Atriplex portulacoides* L. - Ankaran, 2013, J. B., B. R.
522. *Atropa bella-donna* L. - Planina nad Vrhniko, 2013, J. M.
523. *Barbarea vulgaris* R. Br. - Plave, 2013, J. B.
524. *Berberis vulgaris* L. - Jezersko (900 - 1000 m n.v.), 2012, J. M.
525. *Biscutella laevigata* L. - Šentvid, 2013, J. B.
526. *Bromus hordeaceus* L. em. Hyl. - Brege, 2013, J. B.
527. *Buphthalmum salicifolium* L. - Blegoš, 2013, S. F.
528. *Bupleurum petraeum* L. - Porezen, 2013, J. B., B. R.
529. *Capparis spinosa* L. - Piran, 2012, J. B.
530. *Carex flacca* Schreb. - Žadovinek, 2013, J. B.
531. *Carex limosa* L. - Zelenci, 2013, B. V., T. Č.
532. *Carpesium cernuum* L. - pod Mrzlim vrhom nad Volarjami, 2013, L. & I. D.
533. *Centaurea rhenana* Boreau - Žadovinek, 2013, J. B.
534. *Centaurea rupestris* L. - Slavnik, 2013, J. B., B. R.
535. *Centaureum erythraea* Rafn - Šentjurij, 2013, J. M.
536. *Cephalanthera damasonium* (Mill.) Druce - Bloška planota, Kramplje, 2013, B. D.
537. *Chamaecytisus hirsutus* (L.) Briq. - Kucelj, 2013, J. B., B. R.
538. *Chamerion angustifolium* (Raf.) Raf. - Porezen, 2013, J. B., B. R.
539. *Chrysopogon gryllus* (L.) Trin. - Močile (Anhovo), 2013, J. B.
540. *Cirsium oleraceum* (L.) Scop. - Slavnik, 2013, J. B., B. R.
541. *Clematis alpina* (L.) Mill. - Huda luknja, 2013, J. B., B. R.
542. *Convallaria majalis* L. - Porezen, 2013, J. B., B. R.
543. *Cornus mas* L. - Volarje, 2013, L. & I. D.
544. *Cornus mas* L. - Grgarske Ravne, 2012, L. & I. D.
545. *Cornus sanguinea* L. - Dragonja, 2013, J. B., B. R.
546. *Cornus sanguinea* L. - Podsreda, 2013, J. B.
547. *Coronilla emerus* L. subsp. *emeroides* - Lipnik, 2012, J. B.
548. *Corydalis cava* (L.) Schweigg. & Körte - Boč, 2012, J. M.
549. *Cotinus coggygria* Scop. - Dragonja, 2012, J. B.
550. *Crataegus monogyna* Jacq. - Kolovrat (nad Dreko, Italija), 2013, L. & I. D.
551. *Crataegus monogyna* Jacq. - Podgorje, 2013, J. B., B. R.
552. *Crataegus monogyna* Jacq. - Žadovinek, 2012, J. B.
553. *Crepis bocconi* P. D. Sell - Črna prst, 2012, L. & I. D.
554. *Crepis pyrenaica* (L.) W. Greuter - dolina Bale, pod Prevalo, 2012, L. & I. D.

555. *Crithmum maritimum* L. - Piran, 2013, J. B., B. R.
556. *Daphne mezereum* L. - Pokljuka, 2013, J. M.
557. *Daphne mezereum* L. - Staro Utro, pod Trentskim Pelcem, 2013, L. & I. D.
558. *Daphne mezereum* L. - Zelenci, 2013, J. M.
559. *Daucus carota* L. - Koper, 2013, J. B., B. R.
560. *Dianthus armeria* L. - Bela Krajina, Zilje, 2013, B. D.
561. *Dianthus barbatus* L. - Podsreda, 2013, J. B.
562. *Dianthus sanguineus* Vis. - Rakitovec, 2013, J. B., B. R.
563. *Dictamnus albus* L. - Slavnik, 2013, J. B.
564. *Dittrichia viscosa* (L.) W. Greuter - Ankarana, 2013, J. B., B. R.
565. *Doronicum austriacum* Jacq. - Slavnik, 2013, J. B.
566. *Dorycnium germanicum* (Grenli) Rouy. - Podgorje, 2013, J. B.
567. *Dryas octopetala* L. - Svete Višarje, 2013, J. M.
568. *Echium vulgare* L. - Slavnik, 2012, J. B.
569. *Eryngium amethystinum* L. - Lipnik, 2012, J. B.
570. *Erysimum sylvestre* Scop. - Kucelj, 2013, J. B., B. R.
571. *Euonymus europaeus* L. - Podsreda, 2013, J. B., B. R.
572. *Euonymus europaeus* L. - Rakitovec, 2013, J. B.
573. *Euonymus latifolia* (L.) Mill. - Podsreda, 2013, J. B., B. R.
574. *Euonymus verrucosa* Scop. - Šentjurij, 2013, J. M.
575. *Eupatorium cannabinum* L. - Cerknjo-Sušje, 2013, J. B.
576. *Ferulago campestris* (Besser) Grecescu - Rakitovec, 2013, J. B., B. R.
577. *Filipendula vulgaris* Moench. - Rakitovec, 2013, J. B., B. R.
578. *Filipendula vulgaris* Moench. - Slavnik, 2013, J. B., B. R.
579. *Fraxinus ornus* L. - Sv. Volbenk, Goljevica, 2012, L. & I. D.
580. *Galanthus nivalis* L. - Tomišelj, 2013, J. B., B. R.
581. *Galeopsis angustifolia* Ehrh. - Vremščica, 2013, J. B., B. R.
582. *Galium verum* L. - Žadovinec, 2013, J. B.
583. *Genista holopetala* Fleischm. - Čaven, 2013, J. B., B. R.
584. *Genista radiata* (L.) Scop. - Porezen, 2013, J. B., B. R.
585. *Gentiana asclepiadea* L. - Kranj-Udinboršt, 2013, S. F.
586. *Gentiana cruciata* L. - Črni vrh, 2013, J. B., B. R.
587. *Gentiana verna* L. - Porezen, 2013, J. B., B. R., D. K., R. P.
588. *Geum reptans* L. - Mangart, 2013, L. & I. D.
589. *Gladiolus illyricus* Koch - Nanos, 2013, J. B., B. R.
590. *Globularia cordifolia* L. - Kucelj, 2013, J. B., B. R.
591. *Globularia cordifolia* L. - Vremščica, 2013, J. B., B. R.
592. *Globularia punctata* Hegetschw. - Podgorje, 2012, J. B.
593. *Grafia golaka* (Hacq.) Rchb. - Kamniške Alpe; Kamniški vrh, 2013, B. V., T. Č.

594. *Grafia golaka* (Hacq.) Rchb. - Snežnik, 2013, J. B., B. R.
595. *Gymnadenia conopsea* (L.) R. Br. - Bloška planota, Sveta Trojica, 2013, B. D.
596. *Gymnadenia conopsea* (L.) R. Br. - Bloška planota, Ulaka, 2013, B. D.
597. *Gymnadenia conopsea* (L.) R. Br. subsp. *densiflora* (Wahlenb.) K. Richt. - Dedni dol pri Višnji Gori, 2013, B. D.
598. *Hacquetia epipactis* (Scop.) DC. - Vojsko, 2013, J. B.
599. *Hedera helix* L. - Dragonja, 2013, J. B.
600. *Heliosperma alpestre* Rchb. - Porezen, 2013, J. B., B. R., D. K., R. P.
601. *Helleborus multifidus* Vis. subsp. *istriacus* - Čaven, 2013, J. B., B. R.
602. *Helleborus niger* L. - Velika planina, 2012, J. B.
603. *Homogyne sylvestris* Cass. - Uršlja gora, 2013, J. B.
604. *Hypericum perforatum* L. subsp. *perforatum* - Žadovinek, 2013, J. B.
605. *Hypericum perforatum* L. subsp. *perforatum* - Rakitovec, 2013, J. B., B. R.
606. *Hypericum perforatum* L. subsp. *perforatum* - Kolovrat (nad Dreko, Italija), 2013, L. & I. D.
607. *Ilex aquifolium* L. - Vojsko, Mrzla Rupa, 2013, L. & I. D.
608. *Inula hirta* L. - Nanos, 2013, J. B., B. R.
609. *Inula spiraeifolia* L. - Dragonja, 2013, J. B., B. R.
610. *Inula spiraeifolia* L. - Osp, 2013, J. B., B. R.
611. *Iris graminea* L. - Rakitovec, 2013, J. B., B. R.
612. *Iris graminea* L. - Slavnik, 2013, J. B., B. R.
613. *Iris pallida* Lam. subsp. *illyrica* (Tommasini) T. Wraber - Rakitovec, 2013, J. B., B. R.
614. *Iris pallida* Lam. subsp. *illyrica* (Tommasini) T. Wraber - Slavnik, 2013, J. B.
615. *Iris pseudacorus* L. - Želodnik, 2013, B. V.
616. *Iris sibirica* L. - Rateče, 2013, B. V., T. Č.
617. *Iris sibirica* L. subsp. *erirrhiza* - Kojca, 2012, L. & I. D.
618. *Juncus effusus* L. - Slavnik, 2013, J. B.
619. *Juniperus communis* L. - Tolminski Triglav, Poloje, 2013, L. & I. D.
620. *Jurinea mollis* (L.) Reichenb. - Podlipnik, 2013, J. B.
621. *Laburnum alpinum* (Mill.) Presl. - Julijske Alpe, pod Šoštarjem, 2013, L. & I. D.
622. *Laserpitium latifolium* L. - Italija; Kolovrat (nad Dreko), 2013, L. & I. D.
623. *Laserpitium latifolium* L. - Kucelj-Čaven, 2013, J. B., B. R.
624. *Laserpitium latifolium* L. - Rakitovec, 2013, J. B., B. R.
625. *Laurus nobilis* L. - Ankaran, 2013, J. B., B. R.
626. *Leontopodium alpinum* Cass. - Julijske Alpe, Prvi Vogel v Fužinskih planinah, 2013, L. & I. D.

627. *Leucojum aestivum* L. - Cerkniško jezero, Martinjak, 2013, B. D.
628. *Leucojum vernum* L. - Bohor, 2013, J. B.
629. *Ligustrum vulgare* L. - Lj. - Šentvid, 2013, J. B., B. R.
630. *Lilium carnolicum* Bernh. - Snežnik, 2013, J. B., B. R.
631. *Lilium martagon* L. - Dleskovška planota, planina Ravne, 2013, B. D.
632. *Lilium martagon* L. - Porezen, 2013, J. B., B. R.
633. *Limonium angustifolium* (Tausch) Degen - Koper, 2013, J. B., B. R.
634. *Linum narbonense* L. - Slavnik, 2013, J. B., B. R.
635. *Liparis loeselii* (L.) Rich. - Cerkniška jezero, Dujce, 2013, B. D.
636. *Lithospermum officinale* L. - Stena, 2013, J. B.
637. *Lonicera alpigena* L. - Čaven, 2013, J. B.
638. *Luzula exspectata* Bačič & Jogan - Julijske Alpe, Kreda v Fužinskih planinah, 2013, L. & I. D.
639. *Luzula nivea* (L.) DC. - planina Berebica (Trenta), 2013, L. & I. D.
640. *Lysimachia vulgaris* L. - Rakitovec, 2013, J. B., B. R.
641. *Lythrum salicaria* L. - Prevoje, 2012, J. B.
642. *Melica ciliata* L. - Rakitovec, 2013, J. B.
643. *Muscari botryoides* (L.) Mill. - Žadovinec, 2013, J. B.
644. *Myrrhis odorata* (L.) Scop. - Pohoški Kup (Porezen), 2013, L. & I. D.
645. *Myrrhis odorata* (L.) Scop. - Porezen, 2013, J. B., B. R., D. K., R. P.
646. *Nigella damascena* L. - Dragonja, 2013, J. B.
647. *Omphalodes verna* Moench. - Planina nad Vrhniko, 650 m, Ulovka, 2013, J. M.
648. *Orchis laxiflora* Lam. - Movraška vala, Dvori, 2013, B. D.
649. *Origanum vulgare* L. - Podsreda, 2013, J. B.
650. *Orlaya daucooides* (L.) Greuter - Dragonja, 2013, J. B.
651. *Orlaya grandiflora* (L.) Hoffm. - Dragonja, 2013, J. B.
652. *Ornithogalum pyrenaicum* L. - Šentvid, 2013, B. R.
653. *Ostrya carpinifolia* Scop. - Čaven, 2013, J. B., B. R.
654. *Osyris alba* L. - Osp, 2013, J. B., B. R.
655. *Paeonia officinalis* L. - Nanos, 2013, J. B.
656. *Paeonia officinalis* L. - Lipnik, 2012, J. B.
657. *Paliurus spina-christi* Mill. - Dragonja (Stena), 2013, J. B.
658. *Paliurus spina-christi* Mill. - Osp, 2013, J. B., B. R.
659. *Papaver rhoeas* L. - Veniše, 2013, J. B.
660. *Paris quadrifolia* L. - Kolovec, 2013, J. B., B. R.
661. *Pedicularis hacquetii* Graf ex Hoppe - Ravenska planina pod Črno goro, 2012, L. & I. D.
662. *Pedicularis verticillata* L. - Porezen, 2013, J. B., B. R., D. K., R. P.
663. *Peucedanum oreoselinum* (L.) Moench - Žadovinec, 2013, J. B.

664. *Phyteuma orbiculare* L. - Blegoš, 2013, S. F.
665. *Phyteuma orbiculare* L. - Huda luknja, 2013, J. B., B. R.
666. *Pistacia terebinthus* L. - Dragonja, 2013, J. B.
667. *Pistacia terebinthus* L. - Hrastovlje, 2013, J. B., B. R.
668. *Polygonatum verticillatum* All. - Porezen, 2013, J. B., B. R.
669. *Polygonatum verticillatum* All. - Snežnik, 2013, J. B., B. R.
670. *Potentilla caulescens* Torn. - dolina Belce v Karavankah, 2012, L. & I. D.
671. *Potentilla clusiana* Jacq. - Hrašenska planina (Karavanke), 2013, L. & I. D.
672. *Potentilla nitida* L. - Trentski Pelc, 2013, L. & I. D.
673. *Primula auricula* L. - Kucelj, 2013, J. B., B. R.
674. *Primula auricula* L. - Plešivec (Trenta, Staro Utro), 2013, L. & I. D.
675. *Prospero elisae* Speta - Dragonja, 2013, J. B.
676. *Prunella grandiflora* (L.) Scholler - Porezen, 2013, J. B., B. R.
677. *Prunus mahaleb* L. - Podlipnik, 2013, J. B.
678. *Prunus spinosa* L. - Lj. - Šentvid, 2013, J. B., B. R.
679. *Prunus spinosa* L. - Podgorje, 2013, J. B., B. R.
680. *Prunus spinosa* L. - Rakitovec, 2013, J. B., B. R.
681. *Pulsatilla montana* (Hoppe) Rchb. - Nanos, 2012, J. B.
682. *Rhamnus pumilus* Turra. - Rakitovec, 2013, J. B., B. R.
683. *Rhinanthus angustifolius* C.C. Gmelin - Podgorje, 2013, J. B.
684. *Rhodiola rosea* L. - Julijske Alpe, pod Slatno v Fužinskih planinah, 2013, L. & I. D.
685. *Rhododendron hirsutum* L. - Porezen, 2013, J. B., B. R.
686. *Rhododendron x intermedium* Tausch - Plešivec (Staro Utro, Trenta), 2013, L. & I. D.
687. *Rhynchospora alba* (L.) Vahl - Želodnik, Češeniške gmajna, 2013, B. V.
688. *Ribes alpinum* L. - Snežnik, 2013, J. B., B. R.
689. *Rosa canina* L. - Tolminski Triglav, Poloje, 2013, L. & I. D.
690. *Rosa canina* L. - Kanalski Kolovrat, 2012, L. & I. D.
691. *Rosa glauca* Pourr. - Ilirska Bistrica, 2012, J. B.
692. *Rosa pendulina* L. - Kobla, 2013, L. & I. D.
693. *Rosa pimpinellifolia* L. - Čaven, 2013, J. B., B. R.
694. *Rosa pimpinellifolia* L. - Slavnik, 2013, J. B., B. R.
695. *Rosa sempervirens* L. - Dragonja 2011, 2012, J. B.
696. *Rosa villosa* L. - Italija; Kolovrat (nad Dreko), 2013, L. & I. D.
697. *Ruscus aculeatus* L. - Dragonja, 2013, J. B.
698. *Ruscus hypoglossum* L. - Podsreda, 2013, J. B.
699. *Ruta divaricata* Ten. - Hrastovlje, 2013, J. B.
700. *Salvia glutinosa* L. - Šentjurij, 2013, J. M.

701. *Salvia glutinosa* L. - Koreno, 2013, J. M.
702. *Salvia officinalis* L. - Podgorje, 2013, J. B., B. R.
703. *Salvia pratensis* L. - Močile (Anhovo), 2013, J. B.
704. *Sambucus ebulus* L. - Rakitovec, 2013, J. B., B. R.
705. *Sambucus racemosa* L. - Uršlja gora, 2013, J. B.
706. *Saxifraga crustata* Vest - Kucelj, 2013, J. B., B. R.
707. *Saxifraga squarrosa* Sieber - Prvi, Srednji in Zadnji Vogel v Fužinskih planinah, 2013, L. & I. D.
708. *Scilla litardierei* Breistr. - Planinsko polje, 2013, J. B.
709. *Scorzonera rosea* Waldst. & Kit. - Porezen, 2013, J. B., B. R., D. K., R. P.
710. *Serratula lycopifolia* (Vill.) A.Kern. - Rakitovec, 2013, J. B., B. R.
711. *Serratula lycopifolia* (Vill.) A.Kern. - Slavnik, 2013, J. B.
712. *Serratula tinctoria* L. subsp. *tinctoria* - Kolovrat (nad Dreko, Italija), 2013, L. & I. D.
713. *Serratula tinctoria* L. subsp. *tinctoria* - Porezen, 2013, J. B., B. R.
714. *Serratula tinctoria* L. subsp. *tinctoria* - Rakitovec, 2013, J. B., B. R.
715. *Silene hayekiana* Handel - Mazzeti & Janchen - Kucelj, 2013, J. B., B. R.
716. *Silene nutans* L. - Porezen, 2013, J. B., B. R., D. K., R. P.
717. *Solanum dulcamara* L. - Slavnik, 2013, J. B., B. R.
718. *Sorbus aria* (L.) Crantz. - Žabijski vrh, 2013, L. & I. D.
719. *Sorbus aria* (L.) Crantz. - Rakitovec, 2013, J. B., B. R.
720. *Sorbus aucuparia* L. subsp. *aucuparia* - Porezen, 2013, J. B., B. R.
721. *Sorbus aucuparia* L. subsp. *aucuparia* - Staro Utro (Trenta), 2013, L. & I. D.
722. *Sorbus chamaemespilus* (L.) Crantz - Staro Utro (Trenta), 2013, L. & I. D.
723. *Spiranthes spiralis* (L.) Chevall. - Velike Lipljene, 2013, B. D.
724. *Staphylea pinnata* L. - Podsreda, 2013, J. B., B. R.
725. *Stipa eriocalis* Borb. subsp. *austriaca* (Beck) Martinovsky - Podgorje, 2013, J. B.
726. *Tamus communis* L. - Dragonja, 2013, J. B.
727. *Tanacetum corymbosum* (L.) Schultz Bip. - Rakitovec, 2013, J. B., B. R.
728. *Telekia speciosa* (Schreb.) Baumg. - Snežnik, 2013, J. B., B. R.
729. *Teucrium chamaedrys* L. - Čaven, 2013, J. B., B. R.
730. *Teucrium montanum* L. - Staro Utro (Trenta), 2013, L. & I. D.
731. *Tragopogon dubius* Scop. - Podlipnik, 2013, J. B.
732. *Trifolium angustifolium* L. - Dragonja, 2013, J. B.
733. *Trifolium aureum* Pollich - Žadovinek, 2013, J. B.
734. *Trifolium incarnatum* L. - Slavnik, 2012, J. B.
735. *Trifolium incarnatum* L. subsp. *molinarii* (Balb.) Syme - Lipnik, 2012, J. B.

736. *Trifolium montanum* L. - Nanos, 2013, J. B., B. R.
737. *Trifolium noricum* Wulfen. - Mangart, 2013, L. & I. D.
738. *Trifolium rubens* L. - Rakitovec, 2013, J. B., B. R.
739. *Vaccinium vitis-idaea* L. - Plešivec (Staro Utro, Trenta), 2013, L. & I. D.
740. *Veratrum album* L. subsp. *lobelianum* (Bernh. in Schrader) - Porezen, 2013, J. B., B. R., D. K., R. P.
741. *Veronica jacquinii* Baumg. - Slavnik, 2013, J. B., B. R.
742. *Veronica jacquinii* Baumg. - Vremščica, 2013, J. B., B. R.
743. *Veronica officinalis* L. - Snežnik, 2013, J. B., B. R.
744. *Vicia sepium* L. - Porezen, 2013, J. B., B. R., D. K., R. P.

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Dawid Kasprzak (D. K.)

Alenka Marinček (A. M.)

Róža Pasterska (R. P.)

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»Juliana« Alpine Botanical Garden in the Trenta Valley

Nada Praprotnik

Juliana is the oldest extant alpine botanical garden in the natural environment in the territory of Slovenia. It was founded in 1926 by the Trieste proprietor and merchant Albert Bois de Chesne (1871-1953), who wished to create similar living conditions for the plants as enjoyed by them in nature. In his attempts he was aided by his mountaineering friend Dr Julius Kugy. A stroll through the garden is meant as a walk from the valleys to the very peaks of the Slovene mountains.

The garden is situated in the Trenta valley on the picturesque slope of Kukla near the Church of St. Mary some 800 metres a.s.l. and just a few tens of metres above the Soča river. The garden cover 2,572 m². It is meant not only for botanists professionally engaged in plants, but especially those in love with mountains and nature.

When the Primorska region was annexed to Yugoslavia after World War II, the garden could no longer be taken care of by its owner. Initially it was looked after by Slovene botanists under the professional leadership of Dr Angela Piskernik. In 1949, its regular maintenance was temporarily entrusted to the Slovene Museum of Natural History, and finally in 1962. Since 1951, Juliana has been protected as a shaped nature monument. In 1981, when the Law on the protection of Triglav National Park was passed, the garden as a monument of shaped nature was also included in our only national park.

The majority of the plants in the garden have come from the Eastern and Western Julian Alps, Friuli Mountains, Karst hay meadows and pre-Alpine territory, and some from the Karavanke

and the Kamnik-Savinja Alps. To the left of the garden' entrance, some foreign plants not occurring in Slovenia have been planted. Owing to the low altitude and the strong impact of the Mediterranean climate reaching the area through the Soča valley, there are quite a number of high mountain plants which do not prosper well in the "Juliana" garden. Much effort and affection was thus needed for the garden to grow fully and that it has lived more than 80 years.

Juliana is home to some 600 different plant species, including a couple of those growing only in our country. From the other Alpine botanical gardens it differs in its diverse blend of Alpine and Karst plants.

Due to the lack of personnel, wild seeds are not gathered in nature but only in the garden. The annuals' and biannuals' seeds are planted in the so-called "kindergarten" and later on transplanted into the garden itself. From seeds, even some perennials are brought up. The majority of seeds, however, are each year sent to the Botanical Gardens in Ljubljana, which publishes the Index seminum, in which the Juliana seeds are included as well.

In Juliana, no scientific-research work is possible due to the lack of personnel, and neither are guided tours of the garden, except on very special occasions as per preliminary agreement.

Juliana has an extremely important role in the education of its visitors. In this sense, we present the plants in their natural habitats, call attention to their threat status, and to the conservation of natural heritage.

Particularly well developed are our publicity activities. In the last decade we have thus published guides and brochures in Slovenian, English, Italian, German and French languages, as well as a series of 15 postcards with various plant motifs. We have produced DVDs in five languages.

Our Juliana differs from other Alpine botanical gardens in Europe especially in the diverse mixture of its Alpine, Karst and endemic plants. As the oldest alpinum in the territory of Slovenia it also has a very high cultural and historical value.



Alpinum Juliana

Semina in horto alpino Juliana Museum historiae naturalis Sloveni- ae anno 2013 lecta

Nada Praprotnik, Marija Završnik, Klemen Završnik

- 745. *Aconitum angustifolium* Bernh. ex Rchb.
- 746. *Aconitum degenii* Gayer subsp. *paniculatum* (Archang.) Mucher
- 747. *Aconitum lycoctonum* L. em Koelle subsp. *ranunculifolium* (Rchb.) Schinz & Keller
- 748. *Aconitum lycoctonum* L. em Koelle subsp. *vulparia* (Rchb. ex Spreng.) Nym.
- 749. *Adenophora liliifolia* (L.) DC.
- 750. *Adenostyles glabra* (Miller) DC.
- 751. *Aethionema saxatile* (L.) R. Br.
- 752. *Agrimonia eupatoria* L.
- 753. *Ajuga reptans* L.
- 754. *Allium carinatum* L.
- 755. *Allium ericetorum* Thore
- 756. *Allium schoenoprasum* L. subsp. *alpinum* (DC.) Čelak.
- 757. *Allium senescens* L.
- 758. *Allium ursinum* L.
- 759. *Allium victorialis* L.
- 760. *Alyssum montanum* L.
- 761. *Anemone ranunculoides* L.
- 762. *Anemone trifolia* L.
- 763. *Angelica sylvestris* L.
- 764. *Anthericum ramosum* L.
- 765. *Aquilegia bertolonii* Schott
- 766. *Aquilegia einseleana* F. W. Schultz
- 767. *Aquilegia kitaibelii* Schott
- 768. *Aquilegia nigricans* Baumg.
- 769. *Aquilegia vulgaris* L.
- 770. *Arabis alpina* L. subsp. *alpina*
- 771. *Arabis bellidifolia* Crantz subsp. *bellidifolia*
- 772. *Arabis hirsuta* (L.) Scop.
- 773. *Arabis vochinensis* Sprengel

774. *Armeria alpina* (DC.) Willd.
 775. *Aruncus dioicus* (Walter) Fernald
 776. *Asparagus tenuifolius* Lam.
 777. *Aster alpinus* L.
 778. *Aster amellus* L.
 779. *Astragalus carniolicus* A. Kern.
 780. *Astrantia carniolica* Jacq.
 781. *Astrantia major* L.
 782. *Athamanta turbith* (L.) Brot. p. p., em. H. Karst.
 783. *Atropa bella-donna* L.
 784. *Aurinia petraea* (Ard.) Schur
 785. *Betonica alopecuroides* L.
 786. *Betonica officinalis* L.
 787. *Biscutella laevigata* L.
 788. *Buphthalmum salicifolium* L.
 789. *Bupleurum falcatum* L. subsp. *cernuum* (Ten.) Arcang.
 790. *Bupleurum petraeum* L.
 791. *Bupleurum ranunculoides* L. subsp. *ranunculoides*
 792. *Calamintha nepeta* (L.) Savi
 793. *Calluna vulgaris* (L.) Hull
 794. *Caltha palustris* L. subsp. *palustris*
 795. *Campanula cespitosa* Scop.
 796. *Campanula glomerata* L. subsp. *glomerata*
 797. *Campanula rapunculoides* L.
 798. *Campanula spicata* L.
 799. *Campanula trachelium* L.
 800. *Cardamine pentaphyllos* (L.) Crantz
 801. *Carduus defloratus* L. sensu Kazmi
 802. *Carex alba* Scop.
 803. *Carlina acaulis* L. subsp. *acaulis*
 804. *Centaurea alpina* L.
 805. *Centaurea carniolica* Host
 806. *Centaurea dichroantha* A. Kerner
 807. *Centaurea scabiosa* L. subsp. *fritschii* (Hayek) Hayek
 808. *Centaurea scabiosa* L. subsp. *scabiosa*
 809. *Centaurea triumfettii* All.
 810. *Cephalanthera longifolia* (L.) Fritsch
 811. *Cephalanthera rubra* (L.) L. C. Rich.
 812. *Cephalaria leucantha* (L.) Roemer & Schultes
 813. *Cerastium carinthiacum* Vest subsp. *austroalpinum* (Kunz) Kunz

814. *Cerastium subtriflorum* (Rchb.) Pacher
815. *Cerintho glabra* Miller subsp. *glabra*
816. *Chaerophyllum hirsutum* L.
817. *Chamaecytisus supinus* (L.) Link
818. *Chenopodium bonus-henricus* L.
819. *Cirsium carniolicum* Scop.
820. *Cirsium erisithales* (Jacq.) Scop.
821. *Cirsium oleraceum* (L.) Scop.
822. *Cirsium x linkianum* Löhr (*C. erisithales* (Jacq.) Scop. x *C. pannonicum* (L. f.) Link)
823. *Clematis recta* L.
824. *Clinopodium vulgare* L.
825. *Convallaria majalis* L.
826. *Coronilla coronata* L.
827. *Coronilla emerus* L.
828. *Cotoneaster dielsianus* E. Pritz.
829. *Crocus vernus* (L.) Hill subsp. *albiflorus* (Kit.) Ascherson & Graebner
830. *Dactylorhiza maculata* (L.) Soó
831. *Daphne alpina* L.
832. *Dianthus carthusianorum* L.
833. *Dianthus hyssopifolius* L.
834. *Dianthus sanguineus* Vis.
835. *Dianthus sylvestris* Wulfen
836. *Dianthus tergestinus* (Rchb.) Kerner
837. *Dictamnus albus* L.
838. *Digitalis grandiflora* Miller (= *D. ambigua* Murray)
839. *Digitalis laevigata* Waldst. & Kit.
840. *Dorycnium germanicum* (Gremli) Rikli
841. *Draba aizoides* L.
842. *Dryas octopetala* L.
843. *Drypis spinosa* L. subsp. *jacquiniana* Murb. et Wettst.
844. *Echinops exaltatus* Schrader
845. *Echinops ritro* L. subsp. *ruthenicus* (Bieb.) Nyman.
846. *Epilobium montanum* L.
847. *Epimedium alpinum* L.
848. *Epipactis atrorubens* (Hoffm. ex Bernh.) Besser
849. *Epipactis helleborine* (L.) Crantz
850. *Epipactis palustris* (L.) Crantz
851. *Erigeron caucasicus* Steven
852. *Erigeron glabratus* Hoppe & Hornsch. ex Bluff & Fingerh.

853. *Erinus alpinus* L.
854. *Eryngium alpinum* L.
855. *Eryngium amethystinum* L.
856. *Erysimum sylvestre* Scop.
857. *Euonymus latifolia* (L.) Mill.
858. *Eupatorium cannabinum* L.
859. *Euphorbia angulata* Jacq.
860. *Filipendula ulmaria* (L.) Maxim.
861. *Filipendula vulgaris* Moench
862. *Frangula rupestris* (Scop.) Schur
863. *Fumana procumbens* (Dunal) Gren. & Godr.
864. *Galanthus nivalis* L.
865. *Galium boreale* L.
866. *Galium purpureum* L.
867. *Galium sylvaticum* L.
868. *Galium verum* L.
869. *Genista sericea* Wulfen
870. *Genista sylvestris* Scop.
871. *Gentiana angustifolia* Vill.
872. *Gentiana chusii* Perr. & Song.
873. *Gentiana cruciata* L.
874. *Gentianella germanica* (Willd.) E. F. Warburg in Clapham, Tutin & E. F. Warburg
875. *Geranium macrorrhizum* L.
876. *Geranium nodosum* L.
877. *Geranium phaeum* L. subsp. *phaeum*
878. *Geranium pratense* L.
879. *Geranium sanguineum* L.
880. *Geranium sylvaticum* L.
881. *Geum rivale* L.
882. *Geum speciosum* Alboff
883. *Gladiolus illyricus* Koch
884. *Globularia cordifolia* L.
885. *Globularia nudicaulis* L.
886. *Globularia punctata* Lapeyr.
887. *Grafia golaka* (Hacq.) Rchb.
888. *Gymnadenia conopsea* (L.) R. Br.
889. *Gypsophila repens* L.
890. *Hacquetia epipactis* (Scop.) DC.
891. *Helianthemum nummularium* (L.) Mill. subsp. *grandiflorum* (Scop.)

Schinz & Thell.

892. *Heliosperma alpestre* (Jacq.) Griseb.
893. *Heliosperma pusillum* (Waldst. & Kit.) Rchb. subsp. *pusillum*
894. *Helleborus niger* L.
895. *Helleborus odoratus* Waldst. & Kit.
896. *Hemerocallis lilioasphodelus* L.
897. *Hesperis candida* Kit.
898. *Hieracium gymnocephalum* Griseb. ex Pant.
899. *Hieracium porrifolium* L.
900. *Hieracium villosum* Jacq.
901. *Hippocrepis comosa* L.
902. *Hladnikia pastinacifolia* Reichenb.
903. *Homogyne sylvestris* Cass.
904. *Horminum pyrenaicum* L.
905. *Hypericum montanum* L.
906. *Hypericum perforatum* L.
907. *Inula spiraeifolia* L.
908. *Iris graminea* L.
909. *Iris sibirica* L. subsp. *sibirica*
910. *Kernera saxatilis* (L.) Reichenb.
911. *Knautia arvensis* (L.) Coulter
912. *Knautia drymeia* Heuffel
913. *Knautia fleischmannii* (Hladnik ex Reichenb.) Pacher
914. *Knautia illyrica* G. Beck
915. *Laserpitium archangelica* Wulfen
916. *Laserpitium latifolium* L.
917. *Laserpitium siler* L.
918. *Lathyrus occidentalis* (Fisch. & Meyer) Fritsch var. *montanus* (Scop.)
Fritsch
919. *Lathyrus pratensis* L.
920. *Lathyrus vernus* (L.) Bernh. subsp. *vernus*
921. *Lembotropis nigricans* (L.) Griseb. subsp. *nigricans*
922. *Leontodon hispidus* L.
923. *Leucanthemum ircuitianum* (Turcz.) DC.
924. *Leucojum vernum* L.
925. *Libanotis sibirica* (L.) C. A. Mey. subsp. *montana* (Crantz) P. W. Ball
926. *Ligusticum seguieri* (Jacq.) Koch
927. *Lilium carniolicum* Bernh.
928. *Lithospermum officinale* L.
929. *Lonicera xylosteum* L.

930. *Lunaria rediviva* L.
 931. *Luzula nivea* (L.) DC.
 932. *Lycopus europaeus* L.
 933. *Lysimachia vulgaris* L.
 934. *Lythrum salicaria* L.
 935. *Medicago lupulina* L.
 936. *Mentha longifolia* (L.) Huds.
 937. *Meum athamanticum* Jacq.
 938. *Micromeria thymifolia* (Scop.) Fritsch
 939. *Minuartia capillacea* (All.) Graebn.
 940. *Minuartia gerardii* (Willd.) Hayek
 941. *Mycelis muralis* (L.) Dumort. (= *Cicerbita muralis* (L.) Wallr.)
 942. *Myrrhis odorata* (L.) Scop.
 943. *Narcissus poeticus* L. subsp. *radiiflorus* (Salisb.) Baker
 944. *Omalotheca supina* (L.) DC.
 945. *Omphalodes verna* Moench
 946. *Ornithogalum pyrenaicum* L.
 947. *Paeonia officinalis* L.
 948. *Papaver alpinum* L. subsp. *ernesti-mayeri* Markgraf
 949. *Papaver alpinum* L. subsp. *kernerii* (Hayek) Fedde
 950. *Paris quadrifolia* L.
 951. *Parnassia palustris* L.
 952. *Peltaria alliacea* Jacq.
 953. *Petasites albus* (L.) Gaertner
 954. *Petrorhagia saxifraga* (L.) Link
 955. *Peucedanum austriacum* (Jacq.) Koch var. *rablense* (Wulfen) Koch
 956. *Peucedanum cervaria* (L.) Lapeyr.
 957. *Peucedanum oreoselinum* (L.) Moench
 958. *Peucedanum ostruthium* (L.) Koch
 959. *Phyteuma orbiculare* L.
 960. *Phyteuma spicatum* L. subsp. *coeruleum* R. Schultz
 961. *Phyteuma spicatum* L. subsp. *spicatum*
 962. *Plantago atrata* Hoppe subsp. *fuscescens* (Jord.) Pilg.
 963. *Polemonium caeruleum* L.
 964. *Polygonatum multiflorum* (L.) All.
 965. *Polygonatum odoratum* (Miller) Druce
 966. *Polygonum bistorta* L.
 967. *Polygonum viviparum* L.
 968. *Potentilla alba* L.
 969. *Potentilla carniolica* A. Kern.

970. *Potentilla erecta* (L.) Raeusch.
 971. *Potentilla rupestris* L.
 972. *Prenanthes purpurea* L.
 973. *Primula elatior* (L.) Hill.
 974. *Primula veris* L. subsp. *columnae* (Ten.) Lüdi in Hegi
 975. *Prunella grandiflora* (L.) Scholler
 976. *Prunella vulgaris* L.
 977. *Pyrola chlorantha* Sw.
 978. *Ranunculus carinthiacus* Hoppe
 979. *Ranunculus montanus* Willd.
 980. *Reseda lutea* L.
 981. *Rhodiola rosea* L.
 982. *Rhododendron hirsutum* L.
 983. *Rubus saxatilis* L.
 984. *Rumex scutatus* L.
 985. *Ruta divaricata* Ten.
 986. *Salvia glutinosa* L.
 987. *Salvia verticillata* L.
 988. *Sanguisorba minor* Scop.
 989. *Sanicula europaea* L.
 990. *Satureja subspicata* Bartl. ex Vis. subsp. *liburnica* Šilić
 991. *Saxifraga burseriana* L.
 992. *Saxifraga crustata* Vest
 993. *Saxifraga cuneifolia* L.
 994. *Saxifraga hostii* Tausch
 995. *Saxifraga paniculata* Miller
 996. *Scabiosa caucasica* Bieb.
 997. *Scabiosa graminifolia* L.
 998. *Scabiosa hladnikiana* Host
 999. *Scabiosa lucida* Vill. subsp. *stricta* (Waldst. & Kit.) Jasiewicz
 1000. *Scabiosa silenifolia* Waldst. & Kit.
 1001. *Scrophularia vernalis* L.
 1002. *Sedum album* L.
 1003. *Sedum dasyphyllum* L.
 1004. *Sedum maximum* (L.) Hoffm.
 1005. *Senecio abrotanifolius* L.
 1006. *Seseli gouanii* Koch
 1007. *Sibiraea croatica* Degen
 1008. *Silene dioica* (L. em Mill.) Clairv.
 1009. *Silene hayekiana* Hand.-Mazz. & Janchen

1010. *Silene latifolia* Poiret
1011. *Silene nutans* L.
1012. *Silene vulgaris* (Moench) Garcke subsp. *glareosa* (Jordan) Marsde-Jones & Turill
1013. *Silene vulgaris* (Moench) Garcke subsp. *vulgaris*
1014. *Solidago virgaurea* L. subsp. *virgaurea*
1015. *Spiraea decumbens* Koch subsp. *decumbens*
1016. *Stachys recta* L.
1017. *Stachys sylvatica* L.
1018. *Succisa pratensis* Moench
1019. *Tanacetum corymbosum* (L.) Schultz Bip. subsp. *clusii* (Fischer ex Reichenb.) Heywood
1020. *Taraxacum officinale* agg.
1021. *Taxus baccata* L.
1022. *Telekia speciosa* (Schreber) Baumg.
1023. *Tephrosia pseudocrispa* (Fiori) Holub
1024. *Thalictrum minus* L.
1025. *Thlaspi praecox* Wulfen
1026. *Tofieldia calyculata* (L.) Wahlenb.
1027. *Trifolium montanum* L.
1028. *Trifolium rubens* L.
1029. *Trollius europaeus* L.
1030. *Tussilago farfara* L.
1031. *Valeriana montana* L.
1032. *Valeriana officinalis* L.
1033. *Valeriana tripteris* L.
1034. *Verbascum alpinum* Turra
1035. *Verbascum blattaria* L.
1036. *Veronica aphylla* L.
1037. *Veronica barrelieri* Schott ex Roem. & Schult.
1038. *Veronica chamaedrys* L.
1039. *Veronica maritima* L.
1040. *Veronica officinalis* L.
1041. *Veronica urticifolia* Jacq.
1042. *Viburnum opulus* L.
1043. *Vicia oroboides* Wulfen
1044. *Vincetoxicum hirundinaria* Medik.

Curator: dr. Nada Praprotnik

Hortulani: Marija Završnik & Klemen Završnik, dipl. inž. agr. in h.

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Alpski botanični vrt Juliana v Trenti je odprt od 1. maja do 30. septembra vsak dan od 8.30 do 18.30.

Informacije o vrtu posreduje Prirodoslovni muzej Slovenije, Prešernova 20, p.p. 290, SI - 1000 Ljubljana, Slovenija:

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The "Juliana" botanical garden in the Trenta valley is open daily from 8.30 to 18.30 between May 1st and September 30th.

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