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"Save Plants for Earth's Future"

Book of abstracts

Edited by Philippe Bardin,
Erika Pénzesné Kónya & Mykyta Peregrym

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MESSAGE FROM THE PRESIDENT

Welcome to the 8th Planta Europa Conference, a major international event, dedicated to the protection and conservation of wild plants and fungi in Europe.

Unfortunately wild plants in Europe are declining rapidly, climate change is a reality and the time is not on our side. In these circumstances, to protect and to conserve wild plants and fungi and their habitats are significant challenges for all of us.

This conference, organized by a country with a great natural heritage, hosted by institutions with significant experience and bringing together experts from scientific research, from nature conservation and practice represents a good opportunity to work together, to save plants, for the Earth's future.

The conference develops a wide range of topics and creates the framework to address major issues of the wild plant conservation at the European, country and regional levels.

The event is based on sharing experience, knowledge and information and it is dedicated to estimate the progress in implementation of the European Strategy for Plant Conservation (ESPC), published by Planta Europa in 2008 and to update all targets of the Strategy, according to current requirements for effective plant conservation in Europe.

In opening this remarkable event, we express our gratitude to the organizers of the 8th Planta Europa Conference, we warmly welcome the conference participants and wish them success in determining the best decisions, that will contribute to European and global plant and fungi conservation, in accordance with the Planta Europa vision: *a world where plants are valued know and for the future*.

Prof., Dr. Anca Sârbu,
Planta Europa President

WELCOME TO UKRAINE!
A message from the Local Organizing Committee

Dear colleagues,

We are glad to welcome you in the capital of Ukraine, the City of Kyiv, as our guests and participants of the 8th Planta Europa Conference “Save Plants for Earth’s Future”. It is an honor to us to host this scientific event in Kyiv, especially now, when our country has chosen the European priorities in state development and continues to move in this direction, despite the existing difficulties. We are grateful to you for your visit and support of our country in pursuing the important target of saving the plant diversity in Ukraine in particular and in Europe in general.

Nowadays, unfortunately, the rate of biodiversity lost remains very high, and humanity still does not understand properly all risks of this dangerous and irreversible process. However, each and every one of us makes important contribution in changing the situation in both the nature and our society. We hope that the conference will be a great platform for discussing our success stories and problems in this activity in the context of the European partnership under the aegis of Planta Europa.

We hope that you will have productive work and pleasant time during the conference, which will help you to discover the botanical treasures and cultural values of Ukraine.

Sincerely,

Co-Chairs of the Local Organizing Committee:

Dr. Oleksandr Senchylo

Prof., Dr. Sc. Sergiy Mosyakin

Prof., Dr. Sc. Viktor Melnyk

WORKSHOP “DIVERSITY, RESOURCES & CONSERVATION”

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The seed productivity of *Oxytropis almaatensis* in different populations

In Kazakhstan 119 species from 15 sections of the genus *Oxytropis* are observed, 36 species (32.5%) of them are endemic, and 10 are included in Red Book. In the northern Tien Shan, that Trans-Ili Alatau mountains belong to, this genus is on the second place in species number after *Astragalus*. The *Oxytropis almaatensis* Bajtenov belongs to the subgenus *Euxytropis* (Boiss.) Bunge, section *Eumorpha* Bunge, has been described by M.S. Baitenov according to the collection of E. Gorbunova and V.P. Goloskokov in 1937 from the mountains Syugaty and Toraigyr, this species is rare, narrowly endemic.

One of the most important indicators of the adaptation level of species to the habitat specific conditions is the seed productivity. There is also average seed productivity of the plants, i.e. the average number of seeds per individual or per generative shoot and seed yield (total seed production), i.e. number of seeds produced by plants per unit area. According to T.A. Rabotnov (1960), V.N. Golubev and E.F. Molchanov (1978) the seed productivity is assessed by the seed number per generative shoot or individual.

In the central part of Trans-Ili Alatau mountains in territory of Ile-Alatau State National Park we found and investigated three populations of *Oxytropis almaatensis*. As the final account unit one generative specimen was used.

In the studied populations, in generative individuals of investigated species the flowers, fruits and seeds were counted. As a result it was determined that the largest number of flowers, fruits and seeds is characteristic to the individuals of population 3, the smallest - population 2.

The percentage of the fruit formation is high in population 2 (87.9%) and low in population 3 (25.5%). This may be due to the unfavorable conditions of growth of population 3, according to our analysis results, indicators of the soil moisture and *pH* are different in this comparing to the other two.

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The rare vascular sporous plants in the flora of Ukraine

In the flora of Ukraine there are 91 species of vascular sporous plants that belong to *Licopodiophyta* and *Monilophyta* (Smith et al., 2006, 2008; Bezsmertna, 2011; Vasheka, Bezsmertna, 2012; Ryff, 2013; Parnikoza & Celka, 2016). *Licopodiophyta* includes 12 species (*Lycopodiopsida* – 9 species and *Isoetopsida* – 3 species). The main part of these plants belongs to *Monilophyta* – 79 species (*Psilotopsida* – 6 species, *Equisetopsida* – 9 species, *Polypodiopsida* – 64 species). Many of vascular sporous plants are rare and protected on the different levels.

Particularly, the lists of the regional rare plants of Ukrainian administrative territories are the first documents that regulate plants protection on the regional level. Characteristically that these lists often include the trivial for the flora of Ukraine species as *Dryopteris filix-mas*, *Athyrium filix-femina* and other. Now, per one species from *Lycopodiopsida* and *Psilotopsida,* 7 from *Equisetopsida,* 31 from *Polypodiopsida* are protected on the regional level in Ukraine.

According to the legitimate 3rd edition of The Red Data Book of Ukraine (2009), 11 species from *Licopodiophyta* (exclude *Lycopodium clavatum*) and 20 species from *Monilophyta* (4 species from *Psilotopsida* and 16 species from *Polypodiopsida*) are protected on the state level. It should be noted that no one species from *Equisetopsida* is not protected on the state level although they included into the rare plant lists of many regions.

Several vascular sporous plant species of the flora of Ukraine are protected on the international level and included to Aneex I of Bern Convention (4 species), European Red List (16 species) and to the IUCN Red List (10 species).

Based on the data about the rare vascular sporous plant species spreading on the territory of Ukraine and information about protection of their populations *ex situ* and *in situ*, some critical species that need active protecting measures and further research of their populations condition can be extracted. Such species are known only from a few localities of Ukraine (from one to five localities) or significant part of their localities are extinct. There are: *Diphasiastrum issleri*, *Licopodiela helvetica*, *Anogramma leptophylla*, *Asplenium billotii*, *A.* × *heufleri*, *Cheilanthes acrostica*, *C. persica*, *Cystopteris alpina*, *Marsilea quadrifolia*, *Notholaena marantae*, *Pilularia globulifera*, *Woodsia alpina* and *W. ilvensis*.

According to the results of our investigation, we propose to add to next edition of The Red Data Book of Ukraine also *Asplenium* × *alternifolium*, *A. cuneifilium*, *A.* × *souchei*, *Dryopteris villarii* and *Botrychium simplex* species.

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Activity of the Botanical Garden of Maria Curie-Sklodowska University in Lublin for *ex situ* and *in situ* protection of endangered and protected Polish flora species

One of the fundamental tasks of the Botanical Garden of Maria Curie-Skłodowska University in Lublin is to preserve the species diversity of Polish flora by *ex situ* and *in situ* protection of endangered, rare, and protected species.

The collections of the Botanical Garden comprise approximately 1000 vascular plant species from the native flora. This accounts for ca. 1/3 of all native and permanently naturalised vascular species in Poland. A majority of them were obtained from natural habitats and the other species were acquired by exchange of specimens with other botanical gardens in Poland and neighboring countries. The diverse habitat conditions offered by the Garden facilitate cultivation thereof in ecological conditions similar to their natural habitats. Among them, 269 species are regarded as extinct, endangered, rare, endemic, sub-endemic, or relict species; there are also representatives of legally protected in Poland and worldwide (Bern Convention, CITES, Habitats Directive EU, IUCN). The Garden collection comprises 118 species (31.9%) from the Polish Red Data Book of Plants (2014) and 215 species (28.1%) from the Polish Red List of Pteridophytes and Flowering Plants (2016). Furthermore, 181 species account for 42.5% of all vascular plant species that are under legal protection in Poland (Regulation of the Minister of the Environment, October 9, 2014).

The collection of the native flora gathered in the Botanical Garden of Maria Curie-Skłodowska University in Lublin has served as a valuable research material used in in situ protection for 25 years. Under a number of projects, the employees of the Botanical Garden have carried out reintroduction or metaplanation of 79 species in the Lublin Province. They included 29 species that are threatened with extinction or legally protected, e.g. *Iris aphylla* L. [VU] (in 1992, 1993, 1995, 2008), *Echium russicum* J.F. Gmel. [CR] (1993, 2010-2013, 2015), *Primula vulgaris* Huds. [EW] (1993), *Polemonium caeruleum* L. [VU] (1996, 1997), *Iris sibirica* L. [VU] (1997), *Trollius europaeus* L. [VU] (1997), *Betula humilis* Schrank [EN] (1998), *Salix lapponum* L. [CR] (1998), *Linum hirsutum* L. [VU] (2008), and *Chamaecytisus albus* (Hacq.) Rothm. [EN] (2015).

In 2013, a regional seed bank was established in the Botanical Garden of Maria Curie-Skłodowska University in Lublin as part of the FlorNaturROBiA project “Assessment of the population status and *ex situ* protection of wild rare and endangered plant species in Poland”.

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Conservation status of threatened endemic flora of Yüksekova Nehil Marshes in Southeastern Turkey

The present paper reports the findings of field surveys conducted over period (2013-2015) in 40 localities of South-East Turkey for assessing the diversity of phanerogams. No comprehensive floristic studies have been carried out in line with standard methods and internationally accepted criteria of IUCN for categorization of threat level. A total of 1321 specimens were collected comprising of 235 taxa belonging to 39 families and 137 genera. In total 32 (14%) of the species were assessed as threatened. Assessment carried out for 32 species showed that 4 (12.5%) of the species were Critically Endangered (CE), 2 (6.5%) were Endangered (EN), 8 (25%) were Vulnerable (VU), and 18 (56.5%) were Near Threatened (NT). The remaining 56 species fell in the Least Concern (LC) category. Four of the CE species had less than 10 species in their respective area of occupancy (AOO). The major threats to plant biodiversity in the study area are: collection for medicinal use, over-grazing, use, below extreme low tide, land clearing. The study concludes that the dangers to species survival are 'clear and present'. The CE species require immediate attention keeping in view the human environment of poverty, illiteracy and subsistence farming.

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Distribution of *Botrichium multifidum* (*Ophioglossaceae*) in the Transcarpathian Region

Botrichium multifidum (S.G. Gmel.) Rupr. is included in the Red Data Book of Ukraine (2009) as a vulnerable species and in the European Red List (2011), and is protected according to the Addendum I of the Bern Convention.

B. multifidum is a many-regional, mountain-plain, forest-meadow species (Melnyk, 2006). Its range covers Europe, West Asia, the Himalayas, North America, South America (Patagonia) and Australia. The species grows in the Holarctic and is everywhere in small quantities. In Ukraine, it is situated on southern border of its distribution: in the Carpathians, Polissa and in Forest-Steppe zone. A few locations of *B. multifidum* are known from the foothill-subalpine zones of the Carpathians: the Horhany area and the Pip Ivan Maramoroskiy mount. As well the locations of *B. multifidum* were recorded in Rakhiv and Tyachiv districts of the Transcarpathian region. Particularly, in the Rakhiv district, these are near Bogdan village – Chornohora (Kharkevych 1940, *KWHA*); Chornohora (Zapalovych, 1916, *KRAM*); the Pip Ivan Maramoroskiy Mount. The latest verified record of this species has been made in 1994 in the valley of the Kvasniy River in the Holovach settlement belonging to the Marmorosh forestry (Vaynahiy, 1994, the Carpathian Biosphere Reserve's herbarium). Only one location was recorded in the Tyachiv district on the top of Hropa mount (1947, *LWS*). We did not confirm the mentioned locations, probably they disappeared.

A new location of *B. multifidum* has been found by us in the quarter №8 of the Bogdan-Pertos nature-protective research department, Chornohora Massif of the Carpathian Biosphere Reserve at the altitude of 1000 m above the sea level (Moskaluk, Didenko, 2015, KWHA). The species is located on both sides along the automobile road stretching to the mountain valley Rohneska between communities of *Rubus caesius* L. under the cover of *Picea abies* (L.) Karst. Two fragments of compact population of *B. multifidum* counted on 12 individuals, 7 of which were spore-bearing. The plants were distributed sporadically. The population was normal and homeostatic.

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IUCN-Red-List-Index Applied to the Swiss Flora

The Red List status of vascular plant species is widely used for site evaluation, priority setting and planning of conservation actions in Switzerland. Because Red Lists are recognized by the Federal Act on the Protection of Nature the Red List status of species has a legal foundation and is thus revised and updated every 10-20 years by the Swiss Federal Office of Environment. In order to strictly follow the IUCN recommendations for Red Lists assessments and, therefore, use quantitative data wherever possible, the Federal Office has assigned such assessments to the national floristic data centre “Info Flora” with its large Swiss flora database. The second Red List revision of the Swiss vascular plants by Info Flora was published in 2016. Because the last two revisions strictly followed the IUCN Red List assessment method, it was now possible for Info Flora, to apply the IUCN Red List Index and compare the two assessments from 2002 and from 2016. Results show that the Index has an strong explanatory power and that it clearly describes the trends in the state of the Swiss flora. Furthermore, it was also possible to apply the index on ecologically and/or biogeographically defined subsets of the flora and show, in this way, the trends in the conservation state for particular habitats or regions. These trends represent crucial additional information for conservation planning and priority setting of these habitats and regions and their respective species.

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Saving and cultivation of orchids from native flora in the M.M. Gryshko National Botanical Garden of NAS of Ukraine

Flora of Ukraine consists of about 80 species and 28 genera of orchids. Here are perennial herbaceous plants with underground rhizomes or root bulbs. Most of them are notable for ornamental and medicinal qualities. All species of orchids in flora of Ukraine are rare or endangered plants noted in the Red Data Book of Ukraine. Orchids are distinctive biological objects with individual adaptive ability and specific character of propagation.

Recent 30 years orchids are studied in the M.M. Gryshko National Botanical Garden of the NAS of Ukraine in Kyiv, especially such genera as *Anacamptis* Rich., *Cypripedium* L., *Orchis* L., *Dactylorhiza* Nevski, *Epipactis* Zinn, *Gymnadenia* R. Br., *Ophrus* L. and others.

Special attention was focused on study of individual development of orchids and on methods of seed and vegetative propagation. Vegetative propagation of rhizomatous orchids, such as *Cypripedium calceolus* L., *Epipactis palustris* (L.) Crantz, *Goodyera repens* (L.) R.Br. is easy. They propagate easily by underground shoots developed from buds on rhizomes.

When a method of rhizorestitutive propagation of bulbous orchids was developed (Sobko, 1980) it became possible to extend an introductive study without harm to natural populations. This method has practical benefit and is important for nature protection; it gives a chance to propagate bulbous orchids quickly and to get a number of seeds of full value. The best indices under rhizorestitutive propagation are found in genera *Orchis* and *Dactyloirhiza*.

One the plot was created conditions for spontaneous seed germinations of many orchid species, including *Dactylorhiza majalis* (Rchb.) P.F.Hunt et Summerh., *D. incarnata* (L.)Soo', *Epipactis palustris*.

In the conditions of M.M. Gryshko National Botanical Garden in initial culture about 30 species of bulbous and rhizomatous orchids were tested. The study shows that the most of orchid species can be growing and protecting in culture, besides of saprophytic orchids, such as *Neottia nidus-avis* (L.)Rich. and *Corallorhiza trifida* Chatel., needed accessory research and development of special technique for their propagation.

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In vitro propagation of *Pinguicula vulgaris* with conservation purpose in Ukraine

Pinguicula vulgaris L. (*Lentibulariaceae*) is a circumboreal perennial carnivorous plant (3-17 cm high) with basal rosette of fleshy, sticky leaves and single, purple, insect-pollinated flower. The plants produce hibernacula in cold season. This species is listed in the Red Data Book of Ukraine as vulnerable, and is under legal protection in other European countries.

In Ukraine, distribution of the species is restricted to a few western regions. It grows in humid, sunny conditions on wet, calcareous fens. *P. vulgaris* is a species with a limited number of available habitats. Habitat degradation (destruction caused by wetlands amelioration, alteration of the groundwater levels, and increase of the shrub layer density) is the most serious threat to *P. vulgaris* populations. Sexual reproduction of the species could be insufficient in some conditions because of high seedlings mortality. *Ex situ* conservation could be effective to support local populations by increasing the number of individuals or by creating new populations in the appropriate habitat conditions.

Plant tissue culture methods were applied in the work. Murashige and Skoog medium was the basic nutrient medium for in vitro culture. Plant material was collected in 2015 twice: in June (leaves) and July (whole plants with unripe fruits), on the carbonate fen of the Dermansko-Ostrozkyi National Nature Park, Rivne Region, Ukraine.

Usage of leaves as primary cultivation material has proven ineffective because of its high hygroscopic properties, sliminess and sensitivity to sterilizing reagents. The seeds had successfully passed the surface sterilization and germinated *in vitro*.

P. vulgaris plants showed high morphogenetic potential *in vitro* which is proven by their ability to vegetate and spontaneously clone when grown on a nutrient medium without added growth regulators. Growth intensity of the plants grown on a medium with half the concentration of mineral salts did not differ from that on the medium with full mineral content. The addition of growth regulators (kinetin, indole acetic acid) to the cultivating substrate even in low concentrations (0,05-0,1 mg/l) had caused significant increase in regeneration rate of adventitious buds and in number of microclones per explants (3 to 10).

Therefore, in vitro reproduction of *Pinguicula* species is an effective method of plant preservation *ex situ* and could be used for genetic bank creation, re-introduction or repatriation efforts.

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The studies on the distribution and threat of *Adenophora liliifolia* (L.) Besser' natural localities in Central Europe

Siberian ladybells *Adenophora liliifolia* (L.) Besser are one of the rarest, Community Important species of the European lowlands. It is nearly extinct at European lowlands, highlands and the Sudetes Mts. The species is critically endangered with CR IUCN threat category in the Czech Republic and Poland, but still locally abundant in the Slovak Carpathians (VU category).

Our poster provides recent, general data on the present distribution and population trends of its populations in Central Europe. The richest populations occur in Central-Eastern Poland (Kisielany, Warsaw province) and two Slovak localities: Ciganka and Trstenik (Muranska Plain). *A. liliifolia* prefers Ca-rich, N-poor soils, mostly cambisols, histosols and rendzinas. Optimal habitats for this species are light forests (riparian mixed gallery forests, limestone beech forests, thermophilous oak forets, subboreal mixed oak-pine forests, oak-hornbeam forests, seldom relict pine forests) especially at their edges. It can also occur at intermittently wet *Molinia* meadows, relict mountain grasslands and alkaline fens. Some *A. liliifolia* stands eg.: Trstenik at Slovakia have a unique plant cover, extremely difficult for phytosociological classification. After almost 5 year of natural localities monitoring 33 populations of *A. liliifolia* were observed and confirmed in Central Europe (23 in Poland, 5 in the Czech Republic and 5 in Slovakia).

Carpathian sparse pine forests at limestones are climax, seemingly ecologically "stable" ecosystems, requiring only passive area protection. Global eutrophication is the only potential factor threatening them. Light forests at lower altitudes are seminatural, ecologically instable relics of the traditional management (bee hunting, wooden pastures, cavalry military training ground, coppicing, menageries). Without human activity they spontaneously change into dense, shady lime-hornbeam or beech forests. Decline of suitable habitats is the most serious threat to Siberian ladybells.

Abundant populations seem to be not endangered by the pollen limitation or the genetic diversity loss, retain high interpopulation homogeneity and vast viable seeds production, typical for the populations with extensive gene flow.

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Important Plant Areas for Conservation of Species of Section *Pseudophalolepis* Klokov genus *Centaurea* L. in Ukraine

Section *Pseudophalolepis* Klokov of subgenus *Phalolepis* (Cass.) Spach now combines 9 endemic species of genus *Centaurea* L., which grow in the steppe zone of Ukraine and represent Paleo-Pontic group of species with long-lasting Mediterranean connections. All of them entered the Red Data Book of Ukraine and the IUCN Red List.

Distribution of these species is fragmentary, connected mainly with areas of sand steppe on small territory. These areas suffer from a significant anthropogenic influence (afforestation, overgrazing, burning of vegetation etc.). Conservation of species of the section requires developing measures aimed at future protection and management of biotopes of some areas with population of these species along the banks of the Dnipro River, the Pivdennyi Buh and the Inhulets.

We have identified 8 small Important Plant Areas for conservation of 7 species of this section: for *C. protomargaritacea* Klokov – IPA «Halitsynove» (Mykolaiv region, 7.4 ha), for *C. margaritacea* Ten. – IPA «Mishkovo-Pohorilove» (Mykolaiv region, 152 ha), for IPA *C. margarita-alba* Klokov – «Kovalivka» (Mykolaiv region, 19.9 ha), for *C. konkae* Klokov – IPA «Kurylivka» (Dnipropetrovsk region, 65.4 ha) and IPA «Kuchuhury» (Zaporizhia region, 75.8 ha), for *C. appendicata* Klokov – IPA «Lysohirka» (Zaporizhia region, 4.8 ha), for *C. paczoskii* Kotov ex Klokov – IPA «Novohredneve» (Kherson region, 16.2 ha) and «Bobrovyi Kut» (Kherson region, 30.5 ha). Besides *C. breviceps* Iljin is one of the selection criteria for larger IPAs «Kozachelaherska Arena» (Kherson region, 18974 ha) and «Nyzhniodniprovski Pisky» (Kherson region, 10388 ha), *C. donetzica* Klokov is one of criteria for IPA «Sviati Hory» (Donetsk region, 11030 ha). A part of the aforementioned small IPAs are protected as regional nature monuments or reserves. IPAs «Kozachelaherska Arena», «Nyzhniodniprovski Pisky», «Kuchuhury» overlaps with or are included into Emerald Sites, national parks and core of a biosphere reserve. IPAs «Bobrovyi Kut», «Kurylivka», «Lysohirka», «Novohredneve» have not official protected status.

It is necessary to take firm measures to prohibit forest regeneration on areas where these species grow; do activities on renaturalization of slightly disturbed sand areas; create a range of new reserves; implement *ex situ* conservation of species etc.

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Rare species of spontaneous flora of the garden and park landscapes of the Middle Pobuzhzhia

Garden and Park landscapes (botanical gardens, arboretums and monuments of landscape gardening) are usually man-made objects with a collection of exotic cultivated plants. However a species of spontaneous flora also play significant role in their plant cover. It mostly includes native species of regions where garden and park landscape was created. Among them, of particular interest are rare and endangered species, which on one side might be the remains of natural communities, on the other hand, they may be once planted, but well naturalize and form a numerous population able to self-keeping for a long time.

The aim of our study was to make an inventory of rare and endangered species of spontaneous flora in the garden and park landscapes of the Middle Pobuzhzhia region (middle part of the South Bug River basin). During 2015-2016 we have carried out the survey of spontaneous flora and vegetation of 12 garden and park landscapes (arboretums and monuments of landscape gardening) in Vinnytsia and Cherkasy regions. The literature data on spontaneous flora of the studied parks as well as herbarium specimens from herbaria *SOF* and *UM* were used as additional information sources. In the studied flora have been revealed 8 species listed in the Red Book of Ukraine: *Tulipa biebersteiniana* Schult. & Schult. f. s.l., *Euonymus nana* M.Bieb., *Scopolia carniolica* Jacq., *Allium ursinum* L., *Pulsatilla pratensis* (L.) Mill., *Trapa natans* L., *Epipactis helleborine* (L.) Crantz, *Neottia nidus-avis* (L.) Rich. The greatest number of species (8) is characterized by the National dendrological park "Sofiyivka" NAS of Ukraine. It can be explained as the largest area of the park and so long history of studying its spontaneous flora. Although 3 species - *Pulsatilla pratensis*, *Epipactis helleborine* and *Neottia nidus-avis* we report only on the basis of herbarium and published data, as they are not confirmed by modern studies. Only by one rare species were revealed in the Pechera (*Scopolia carniolica*), Sokilets (*Pulsatilla pratensis*), Verkhivka (*Trapa natans*) and Kryzhopil (*Epipactis helleborine*) monuments of landscape gardening. Keeping of these species populations requires the development of special protection measures to be applied in a complex of measures on conservation the entire garden and park landscape.

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Host-dependent differences of juniper dwarf mistletoes (*Arceuthobium oxycedri*) morphology and phenology in the Crimea

Juniper dwarf mistletoe (*Arceuthobium oxycedri* (DC.) M. Bieb) (*Viscaceae*) is the semi-parasitic species for the Holarctic *Cupressaceae* hosts. Unlike most *Arceuthobium* species with high level of host-specificity, *A. oxycedri* could parasitize a wide host range from *Juniperus* (most commonly reported principal hosts), *Chamaecyparis, Cupressus*, and *Platycladus* genera. The Crimean Peninsula (Crimea), which is almost completely surrounded by the Black Sea, is supposed to be the north-eastern exclave of the Sub-Mediterranean region and is included to *A. oxycedri*'s world range. Fully isolated endemic populations of *A. oxycedri*'s principal host − Eastern prickly juniper (*Juniperus deltoides* R.P. Adams), which is currently distinguished from Western prickly juniper, *J. oxycedrus* L. − reside at the Crimean Mountains.

The current study updates the status of *Arceuthobium oxycedri* and its hosts at the Crimean Peninsula, clearly defining three out of twelf known representatives of *Cupressaceae*. Only *Juniperus deltoides* from native flora is supposed to be its primary (principal) host. Moreover, locacal massive invasions of Greek juniper, *J. excelsa* (secondary host), and naturalized adventive species *Platycladus orientalis* (occasional, or rare host) have been revealed (Krasylenko, 2014; Krasylenko et al., 2017, in press).

Using eight morphological characteristics (aerial shoot length, basal diameter, $1^{st}/2^{d}/3^{d}$ internode lengths and widths), we investigated aerial shoot morphology of male and female *Arceuthobium oxycedri* plants on three hosts. It was found that *A. oxycedri* sexual dimorphism of vegetative parts is not as evident as its morphological variations between three main hosts. In turn, *A. oxycedri* of both sexes show morphological differences on *Juniperus excelsa* (shorter internodes length) and *Platycladus orientalis* (reduced aerial shoot length, basal and internode diameters) as compared to the principal host. Thus, the switch to other host is accompanied by morphological changes of the parasite, which could be explained by its physiological reorganization. The delay of *A. oxycedri* flowering, fruit maturation and seed dispersal untill late December at some sites of South-Eastern Crimea was seen on secondary host *Juniperus excelsa*, while *Arceuthobium oxycedri* on *Platycladus orientalis* followed almost the same phenological patterns as on *Juniperus deltoides*.

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Prioritising plant species of special concern for conservation and management at the regional level

Assessment of species extinction risk, such as the assignment of IUCN Red List Categories (IUCN 2012), and setting conservation priorities which takes into account several other factors are two related but different processes. Through categorizing and prioritizing species of special concern decision-makers can allot recovery resources, plan reserve systems, restrict development and exploitation, and report on the state of biodiversity. Because the conservation of biodiversity occurs under time and resource constraints, it is necessary to prioritize species most deserving of attention.

By using a few meaningful criteria, we developed a new priority-setting approach to prioritize plant species most deserving of attention at the regional level (Kricsfalusy & Trevisan 2014). This assessment is based on rather limited resources available in contrast to complex multi-criteria methods that often have become the norm in plant conservation. The collected information about distribution of 418 vascular plant species in the province of Saskatchewan, Canada, was quantified to develop priority scores using three key criteria: (1) regional responsibility in species survival, (2) species local population characteristics, and (3) the anthropogenic threats causing species to be rare. The use of a hierarchy of these criteria, wherein regional responsibility was assigned the most weight, resulted in the highest ranking for 13 plant species that exist only in the province. The method was deemed to be highly relevant to conservation managers and decision makers due to its scale adaptability and fairly minimal resource requirements. We believe that employing this approach would allow a better assessment of plant species of special concern before their extinction risk increases.

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What can we learn from comparative population studies of *Pulsatilla patens* (L.) Mill. *sensu lato* in North America and Europe for?

Conservation of *Pulsatilla patens* is of growing concern across the whole its range. The species is included in the European Red List and in the Red Data Book of Ukraine. Conservation status of *P. patens* has recently been ranked in six U.S. states and two provinces of Canada.

We analyzed the size of *P. patens* populations, their age structure and reproduction in different habitat types and disturbance regimes. The field surveys were conducted in Boreal Plain and Prairie ecozones of Saskatchewan, Canada and on the border of Forest and Forest-Steppe zones in Kyiv, Ukraine.

Habitat factors and disturbance regimes affect population parameters and regeneration potential in various ways. In Canada, the population size varies from solitary individuals to >10000 plants. Disturbances include grazing, burning and recreational trampling. In prairies with low disturbances populations have complete age spectra dominated by *v* or *g* plants; in prairies with moderate disturbances prevail incomplete age spectra dominated by *j*, *v* or *g* plants; and in shrublands and forests with low / moderate disturbances succeed complete age spectra dominated by *j* plants. Dissemination occurs regularly in all populations.

In Ukraine, populations are heavily affected by forest management which can lead to complete habitat destruction. The population size in forest habitats varies from solitary individuals to 500 plants. Disturbances are caused by human impact (regular burning, digging up plants and picking flowers). As a result, populations have incomplete age spectra dominated by *g* plants. The *j*, *im*, and *v* plants were observed only in some years. Populations have high ratio of abortive flowers and rarely produce seeds.

Thus, in Canada, *P. patens* requires maintaining of natural disturbance regime to sustain a stable population structure. In Ukraine, strict conservation areas to protect habitats of *P. patens* should be established; illegal trade of the plants must be stopped.

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Assessment of state and stability of populations of model rare and threatened plant species in Belarus

In Belarus 303 species of plants and fungi are included in the Red Data Book. The quantity of many of them is decreasing. To develop adequate measures of protection and recommendations for restoration, a full evaluation of their state and stability is necessary.

The objects of the study were populations of model species of rare and threatened plants *Huperzia selago*, *Anemone sylvestris*, *Trollius europaeus*, *Isopyrum thalictroides*, *Melittis sarmatica*, *Lilium martagon*, *Listera ovata*, *Orchis morio*, *O. mascula*, *Neckera pennata*.

The parameters on which the state and stability of populations depend were measured at three levels of spatial organization: local, metapopulation and regional. A certain set of characterizing parameters corresponded to each level.

Studying the local populations the area, population size, density, projective cover, age structure, vitality were determined. At metapopulation level the number of local populations in the metapopulations, their measure of connectivity, the number of individuals, the area, and the distance between local populations were determined. At regional level, the part of local populations with high probability of disappearance was determined.

As an indicator of stability, the average annual increase in the size of local populations and metapopulations was considered.

The connection between the average annual increase and the integral factor of the influence of the initial size, vitality and the measure of connectivity on the stability of local populations (R_i) was revealed. For different species, a certain value of this factor (critical) was typical. When value of R_i was less than critical value, the probability of extinction of local populations increased.

It was shown that among the studied species the regional populations of *Trollius europaeus*, *Orchis morio*, *Lilium martagon* and *Isopyrum thalictroides* have the greatest probability of extinction – more than 60% of local populations with high probability of disappearance. *Listera ovata* and *Orchis mascula* have more than 50% of local populations in an extremely unstable state.

The results of the study showed that the reason for the unstable state of regional populations of a number of species is their narrow ecological amplitude, as well as intensive anthropogenic and zoogenic loading.

The use of the proposed integral factor R_i makes it possible to estimate the state of local populations rather quickly and accurately on the basis of a quantitative approach and to predict their probable disappearance.

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The need for protection of intraspecific diversity: the case of *Juniperus* sect. *Sabina*

The effective protection of the species requires preserving the diversity of their gene pool. Especially plant species with wide and scattered ranges may show internal variety, related with their history. These ranges usually are the effect of the geological events, followed with so called species migration. The consequent biogeographical structure in the longer period may lead to arising of new taxa. With this review paper we present the phenomenon on the example of several Mediterranean species of *Juniperus* sect. *Sabina*. Their ranges often consist of many parts, isolated sometimes even since the Tertiary, and in some cases differing with their habitat. The congruent results of both molecular and morphological analyses of the taxa diversity let draw taxonomic conclusions. One example can be *J. thurifera*, which differentiation into two subspecies: *thurifera* and *africana*, was eventually confirmed by the analyses of essential oils, AFLPs and morphology. *J. phoenicea* is also highly differentiated and the two reported internal taxa were recently recognized as separate species: *J. phoenicea s. str.* and *J. turbinata*. For *J. turbinata* further differences were found between the European and African populations, similarly as in the case of *J. thurifera*. New studies on morphology found distinctivness of possible another taxon within *J. phoenicea* complex: *J. canariensis*. The greek juniper (*J. excelsa*) is another species with fragmented range, high internal diversity and unclear taxonomy. Two taxa of this complex are accepted as separate species: *J. excelsa* and *J. polycarpos*. The latter is further differentiated into *J. seravshanica*, recently recognized as a separate species, and *J. polycarpos* var. *turcomanica*. The distribution of *J. sabina* is also wide and new studies revealed a presence of a variation ”balkanensis” growing in the part of the Balkans. The above examples should raise the awareness of the need of protect the internal diversity of species.

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Methodology of plant conservation on different levels of biodiversity

Biodiversity conception directs attention mainly to informational aspects of exchanges and connections as between biological objects, as also between it and environmental. Different levels of diversity of biological and geographical objects can have different indicators, methodology of description and conservation activities.

According to Jurtzev (1992) with addition by Maslovsky (1997), plant diversity can be subdivided into taxonomic (high taxa, species, populations of different levels, individuals); communities and habitats and chorological units or floras of different levels. Levels of populations may be connected with levels of floras: geographical population - flora of natural or biogeographical zone, regional population – flora of natural region, metapopulation – flora of landscape, local population – habitat, community, ecotope.

Europe includes different natural zones. Therefore, although the majority of endemics are concentrated in the Mediterranean, the main direction of biodiversity conservation in Europe should be focused on protecting the whole complex, including the richness of flora and ecosystems of tundra, taiga, broadleaf forests, steppes, mountains.

Rare plant species and their geographic populations should be protected within the natural zone or a large biogeographic region. Thus, there are opportunities to protect relicts, which in other regions are spread more widely.

The conservation of concrete populations and habitats should be planned together with an analysis of the distribution and structure of metapopulations of the species and habitats within the landscape.

Similar approach can be applied to create an effective IPAs system. It should cover all natural zones and biogeographic regions of Europe. And within the region, their number and its distribution should be such as to enable the conservation of the most significant European threatened species and habitats. Unfortunately, at present the IPAs are not connected and they exist separately. A harmonious system of interconnected IPAs will ensure their greater stability, the possibility of species migration and the restoration of populations due to the receipt and exchange of seeds.

Thus, the application of this approach raises the importance of collecting and analyzing information at all levels of biodiversity on a single methodological basis, coordination of research and actions. The basis of such a relationship can be Planta Europa.

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Plant diversity of Ukraine: Pan-European value and conservation

Ukraine is characterized by high diversity of wild flora. This richness in plant life owes to wide variety of ecosystems, including coniferous pine and spruce forests, deciduous oak, beech and hornbeam forests, steppe grasslands, subalpine and alpine communities of the Carpathian Mountains and submediterranean communities of Crimean Peninsula. Ukrainian flora is one of the richest in Europe and includes over 4,520 species of vascular plants from 997 genera and 189 families. Ukraine, covering 5,7% are of Europe, houses 37% European vascular plants.

It was the Quaternary glaciations that determined the current flora of Ukraine. Ukrainian uplands were refuges for some species during glaciations. Many relict species (*Daphne sophia* Kalen., *D. cneorum* L., *Euonymus nana* Bieb., *Staphylea pinnata* L., *Sorbus torminalis* (L.) Crantz., *Rhododendron luteum* Sweet., *Gymnospermium odessanum* (DC.) Takht.) remain in these refuges until today.

Nine per cent of species of Ukrainian vascular plants are endemics. The richest centers of plant diversity of Ukraine are mountain regions: Crimean Mountains, occupying only 1,2% of Ukrainian territory, feature 2400 species of vascular plants, and Carpathian Mountains, occupying 15% the territory of Ukraine, with ca 2050 species. Both mountain regions are characterized by high endemism. There are 240 endemic species in the flora of Crimean Mountains, and 133 endemic species in the flora of Ukrainian Carpathians.

There are some rare species in Ukraine, not endemics, absent in other regions in Europe, for example, Spiranthes sinensis, known from single locality in our country and in Europe in all and has large distribution in Asiatic part of area.

The Ukrainian natural plant cover has been greatly altered by human activity. Less that 32% of the country has natural or seminatural vegetation. Only 14,3% of Ukrainian territory is covered by forests. The number of endangered native plant species has increased while many newcomers increased in terms of numbers and distribution. The flora of Ukraine includes 190 adventive species.

The problems of *in situ* and *ex situ* plant protection in Ukraine are regarded.

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Geographical distribution and modern state of populations of *Liparis loeselii* (L.) Rich. (*Orchidaceae* Juss.) in Ukraine

Geographical distribution, ecological and coenotic condition of habitats and modern state of populations of *Liparis loeselii* (L.) Rich (*Orchidaceae*) were studied in Ukraine. This species in included to the European Red List, lists of protected plants of Bern Convention and CITES Convention, to Red Data Books of all European Countries.

L. loeselii grows in swamps and marshy meadows of Eurasia and North America. In Ukraine it occurs hear southern border of area and it grows mainly in Polesian lowland and forest steppe zone. From begging of floristic investigation to our days *L. loeselii* is known from 62 localities. Most of them were recorded before 1950. Alter 1950 only 21 localities were recorded, including new and confirmed previounagly known obviously, 12 populations fixed 1950 has not survived to our days.

Elimination of these populations connected with antropogenic influanies (heany drainage of boggy ecosystems, agicicatural using of territories, built on).

Ukrainian populations of *L. loeselii* are very small in number. Largest population is consisting only from 300 individuals.

In Ukraine, *L. loeselii* is protected in ShatskiY and Dermansko-Ostrozhskyi National Natural parks, in Kanivskiy, Rivnenskiy, Cheremskyi reserves, in botanical reserve “Kempa” (Lviv region).

According to our recommendation and scientific ground was created a botanical reserve «Ozerysche» (area 21.7 ha in Volhynian region) for protection *L. loeselii* and other rare listed in the the Red Data Book of Ukraine species.

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Habitat restoration of old-fields in Körös-Maros National Park (Hungary) with *ex situ* propagation and planting of loess grassland

Nowadays the *ex-situ* conservation of endangered species has become one of the most important tasks of the botanical gardens because of habitat loss, vulnerability and biodiversity decreasing.

Botanical Garden of Szeged University carried out a project in the territory of the Körös-Maros National Park with the following tasks: collection of propagulums from natural loess grasslands, *ex situ* propagation and plantation of at least 3000 individuals of rare and protected loess plants to old-fields with different ages.

The collection of the propagulums was carried out during 2011. The outdoor propagation of 29 species was started with seed-sowing in the autumn of the same year. The seeds of 21 species were sowed in light-chamber in March of 2012. Outplanting was carried out in October of 2012.The propagation was successful; 5914 individuals of 32 species were managed to propagate.

Four, partly restorated former arable fields were chosen as a site of the plantations in the northern part of the National Park. The individuals were planted to the four sites according to a preliminary determinated arrangement; to the angles of a 1,5 m x 1 m grid on the suitable parts of the old-fields. During the outplanting the distribution of the individuals was imitated the spatial pattern of a natural loess grassland community.

Individuals of abundant species (*Silene otites, Phlomis tuberosa, Senecio doria, Thalictrum minus, Filipendula vulgaris*) were planted to every sites, species with low-abundance (*Ajuga laxmannii, Astragalus austriacus, Peucedanum alsaticum, Carduus hamulosus, Scutellaria hastifolia*) were planted to only one site. The condition and survival of plants was monitored yearly between 2013 and 2016 in the experimental sites, the number of new individuals was recorded.

According to our four-years data the plantation experiment was successful, the planted individuals of 29 to 32 species survived and reproduced in all habitat, the survival of individuals of 1 species was uncertain and only individuals of 2 species disappeared.

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The introduction of cryogenic long-term seed storage for conservation of endangered species of Polish archaeophytes

At present tremendous changes in Polish agriculture caused the massive disappearance or extinction of old segetal weeds. One of the most endangered groups of species are archaeophytes. Archaeophytes are alien plant species introduced before 15th century, well adapted to traditional methods of cultivation as weeds. In Poland they are represented mainly as Mediterranean and Irano-Turanian origin species. Many of them are included in Polish Red Data Book, such likewise *Scandix pecten-veneris, Adonis flammea, Ajuga chamaepitys, Conringia orientalis, Kickxia spuria* or *Bupleurum rotundifolium*. It's difficult to protect sites of these species *in situ* because usually they occur on the private lands. So it was decided to undertake the studies on *ex situ* conservation of endangered archaeophytes through long-term seed storage in cryogenic conditions in seed bank of PAS Botanical Garden in Warsaw-Powsin. First research was focused on three species included in "Red List of Vascular Plants in Poland": *Scandix pecten veneris, Ranunculus arvensis* and *Kickxia elatine*. Studies on seed germination indicated the requirements for temperature and light for each species. *Scandix pecten veneris* and *Ranunculus arvensis* showed the highest germinability in the lowest temperature (4°C), even in total darkness. In higher temperature (15°C) the germinability was lower, and it was inhibited in the highest (25/15°C) temperatures. Unlike this two species *Kickxia elatine* produced dormant seeds which germinated in highest temperatures (25/15°C and 15°C) and did not germinate in 4°C. Dormancy for *Kickxia elatine* was effectively broken by wet-cold stratification or by gibberellic acid (GA3). In the next step – the tolerance for ultra-low temperatures was checked for the same species. Seeds were dried to 5,4-13,8% moisture content. The viability of samples directly immersed in liquid nitrogen, slowly frozen (0,5°C/min.) to -196°C and stored in LN2 for 30 days were compared with viability of un-frozen control samples. There were no differences in viability of frozen and control samples. The results showed also that all three species produce seeds with orthodox seed storage behavior that maintain its viability after drying. The results has shown that seeds cryo-storage can be the supplement or alternative method for classic *ex situ* conservation in living collections of botanical gardens. The material deposited in the seed bank can be used in the future for reintroduction projects.

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Threats to mountain agrobiological biodiversity

Zailiskiy Alatau is a mountain range in the northwest of the Tien Shan (on the border of Kazakhstan and Kyrgyzstan). According to the scheme of floral zoning (Flora of Kazakhstan, 1956) belongs to the floristic region of Zailiysky Kungei Alatau.

Since 30th of last century there were intensive developed of mountain gardening in Zailiskiy Alatau and these was carried out by felling and revaccination of wild fruit trees. At the same time there was afforestation of forest uncovered plots in wild fruit zones by seedling of cultural varieties (forest gardens). Currently forest gardens and summer cottage are disseminated throughout the wild-growing area interspersed with plantations of wild apple trees.

The impact of natural factors on MAD is equally important as temperature and humidity changes. This resulted in a rise of 100-200 m above sea level of the lower boundaries of the natural and climatic zone of the MAD growth species.

Additional threat is infiltration by young growth of priority forest-forming species by animals and its damage by mowing is determined by a reduction in the self-renewal of populations and a decrease in their resistance. Grazing at the same time is an additional factor in increasing the genetic erosion of natural populations of apple and apricot due to the introduction of cattle seed varieties from cultivated gardens.

Next threat is excessive and unregulated exploitation of the territory's resources leads to the destruction of the forest environment and the reduction of the area not only the fruit species but also the economically valuable and endemic species of the genus *Allium*.

The mountainous areas of Kazakhstan and Central Asia represent a huge species-forming center which is confirmed by a great number of endemic, relict and rare species among onions in the Tien Shan region.

Allium genus is one of the large polymorphic genus has still not found its final position in the phylogenetic system. In the world it has big interest as an object for multisite studies of natural species of onions.

In Kazakhstan there have been conducted activities on introduction of natural onion species, realized an international Kazakhstan-Israeli field trip funded by Yad Hanadiv Grant № 5549.00 to study onion species in Central Asia.

We are pleased to invite the interested colleagues for international cooperation on conservation of mountain agrobiodiversity on a grant basis.

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Red Listing and Red Data Books in Ukraine in the Past, at Present and in the Future

History of the Red Listing counts about 90 years in Ukraine, and it has been started from the article by Ye.M. Lavrenko (1927) with the list of rare plants which were found between Mius and Kalmius rivers. The first list of rare and endangered of plants of Ukraine was published by M.I. Kotov (1962, 1964). After that it was updated several times by V.I. Chopyk (1963, 1970, 1978), before publication of the first edition of the Red Data Book of Ukrainian SSR as an official government document (1980). It is important to note that the event became possible due to publications of the Red Data Book of the USSR (1975, 1978), the List of rare, threatened and endemic plants for the countries of Europe (1977), The IUCN Plant Red Data Book (1978) and others. In time of Ukrainian independence, the two editions of the Red Data Book were published (1996, 2009) and the next one has to be prepared to 2019.

Regional Red Listing has been started since 1970 by O.M. Dubovik who prepared a list of rare plants of the Donetsk Upland. The investigations were continued by botanists from Crimea who published two editions of rare plant list for the peninsula (Luks, Ktyukova, 1973; Luks et al., 1975). In the next decade, number of such publications increased, and they concerned both natural and administrative regions. The first official regional lists of rare plants were accepted in several regions of the Ukrainian SSR by their leaderships in 80th. Now only Cherkasy region doesn't have any official edition of the regional list.

We will consider these and other questions of current state and future of Red Lists and Red Data Books in Ukraine during our presentation.

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From theory to action: conservation of the Black Rampion in the Netherlands

For rare and endangered plant species, population size itself can increase the risk of extinction. Small populations have usually a reduced amount of genetic variation, which enhances inbreeding. Moreover, genetic erosion can decrease seed set due to a lack of suitable mating partners in self-incompatible species. Therefore, conservation programmes solely based on habitat restoration might not be able to save these species.

Here, we present the case of the Black Rampion (*Phyteuma spicatum* ssp. *nigrum*), a perennial herb occurring in meadows, forests and forest edges. During the last 50 years, the species has shown a dramatic decline in both population number and size in the Netherlands, and it is currently Red Listed as endangered. In the year 2013, population monitoring showed that the situation was critical in the nature reserve Drentsche Aa: only small and isolated populations were left. Hydrological changes are likely the cause behind the severe population decline in this area.

Previous research has demonstrated that the Black Rampion is self-incompatible, meaning that cross-pollination with another S-allele in needed for successful fertilization and seed set. It was also found that the main pollinators are short-distance flying bumblebees (max. 200 m), and that seeds are short-lived and lack specific dispersal mechanisms. Altogether, this suggests no or very limited gene flow between the remaining Black Rampion populations in this area.

Therefore, we started a conservation program which included genetic reinforcement of the remaining populations in addition to optimization of the management of the growth sites. At five sites, spots with open soil were created where seeds from other local populations were sown. Germination of the seeds has been monitored and small seedlings have been observed. Examination of the seeds in the same year of the sowing revealed decreasing seed set with increasing population isolation, and higher germination rates for seeds originating from larger populations. This suggests that genetic erosion is indeed likely a problem for population rejuvenation.

This conservation project of the Black Rampion illustrates how knowledge from previous research can be used to start with action straight away to save endangered plant species.

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25 years of seed banking for *ex-situ* conservations of rare and threatened plants in Poland

Botanical Garden of the Polish Academy of Sciences in Warsaw in last 40 years has put a lot of efforts for *ex situ* conservation of native flora of Poland. In 1992 the National Seed Bank of Polish Native Plants was organized, devoted to conservation of rare, threatened and protected by law plant species in Poland. For the long-term storage of orthodox seeds the cryopreservation technique was applied by means of desiccated seed storage in vapor of liquid nitrogen at temperature ca. -160^{o}C. The seed bank was supplied with modern equipment: desiccation chambers, germination cabinets, cryogenic vaults and tanks, as well as, computerized controller for freezing. In the years 2004-2009 Botanical Garden of PAS participated in the EU FP6 project ENSCONET (European Native Seed Conservation Network) as leader of Activity Group "Seed Curation" represented by 24 Seed Banks of native plants from 17 European countries. In 2008 the Botanical Garden of PAS in Warsaw invited for cooperation in the area of native plants seed banking the Forest Gene Bank Kostrzyca located in SW Poland. In the years 2009-2013 both seed banks participated in 2 separate but supplementary EU projects FLORNATUR-OB and FLORNATUR-LBG. These projects were aimed to *ex situ* conservation of rare and threatened plants in Poland by means of long-term seed storage and seed samples of 129 species from 290 localities were collected and preserved in duplicate storage. As continuation of these projects the National Fund for Environment Protection in Poland decided to support in the years 2011-2013 the national project FLORNATUR-ROBiA also devoted to ex situ conservation by seed banking of rare and highly threatened plants in Poland. The project was coordinated by the Council of Botanical Gardens and Arboretums in Poland (ROBiA) and was performed by four botanical gardens: PAS in Warsaw, in Mikołów, in Poznań and in Lublin, as well as, the Forest Gene Bank Kostrzyca. In total the seed samples from 75 natural localities were collected representing 33 plant species of threatened plants and preserved in cryogenic seed bank in Warsaw and in satellite seed banks in Mikołów, Poznań, Lublin and Kostrzyca. At present the Seed Bank of Native Flora at the Botanical Garden of the Polish Academy of Sciences possesses for the long-term storage in LN2 the holdings of the 756 seed samples, representing 225 native vascular species, all collected from natural localities in Poland.

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Morphogenesis and biochemical studies in plant long-term *in vitro* Germplasm Bank

Large-scale long-term *in vitro* collections are an efficient tool for endangered plant species conservation and utilization. Appropriate choice of explants, culture media compositions and cultivation conditions allows successful multiplication of plant material and its estimation for research and practical application. Germplasm Bank of the world flora of the Institute of Cell Biology and Genetic Engineering contains more than 5000 seed specimens as a source of *in vitro* plants and cell lines for micropropagation, biochemical analyses and genetic transformation.

Some *Crambe* species (*Brassicaceae*) are listed to the Red Data Book of Ukraine and can be a source of genetic material for oilseed crops improvement. The protocols of seed surface sterilisation and micropropagation for endangered *Crambe* species (*C. tataria, C. koktebelica, C. aspera, C. mitridatis, C. steveniana, C. maritima*) have been developed. The highest regeneration rates for *C. tataria, C. maritima* and *C. koktebelica* were shown in petiole explants on MS medium with 2.5 mg/l BA and 0.1 mg/l NAA; for *C. steveniana* - 2.5 mg/l BA and 1.5 mg/l NAA; for *C. aspera* - 5 mg/l BA and 1 mg/l NAA, and for *C. mitridatis* - 5 mg/l BA and 1.5 mg/l NAA. Further GC-MS study of fresh leaves showed a presence of C12:0, C16:0, C18:0, C18:1, C18:2, C18:3 fatty acids in all studied species; whereas C24:1 has been found in *C. steveniana* and *C. tataria* leaves only.

Callus culture of *Celosia cristata* L. (*Amaranthaceae*) is kept in the Bank for more than 10 years. Casein hydrolysate adding to the medium stimulated red pigments synthesis in this long-term callus line which is retaining for more than 4 years. The callus is a non-organogenic friable red-violet colored mass with some areas of different color saturation. It is maintaining with the growth index of 2.9 ± 0.9 on MS medium with 1 mg/l 2.4-D, 1 mg/l BA, and 1 g/l casein hydrolysate. The pigments produced by callus are betalains - nitrogen-containing pigments which occur in plants of majority *Caryophyllales* families. They have an excellent antioxidant activity and are used as a colorant in food industry. Total betalain content in water extracts of the callus have been determined; it amounted to 0.15 ± 0.01 mg/g of callus fresh weight and betacyanins made up 73% of total pigments content (0.11± 0.01 mg/g FW of callus). It is approaching the level of accumulation in some commercially used betalain sources: e.g. the roots of red beetroot (0.4 – 20 mg/g FW), pitaya fruits (mainly cacti of *Hylocereus* genus) – 0.32-0.4 mg/g FW.

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Inventory of EU natural habitats in Lithuania – a new stage of the protection of vegetation cover

Country-wide inventory of EU habitat types (Annex I of Habitats Directive (92/43/EEC) has opened a qualitatively new perspective for the improvement of the system of vegetation cover protection in Lithuania.

During four seasons of field work, all sites retaining natural characteristics have been visited; habitat types were identified, polygon boundaries were drawn, the data on habitat structure and status (including species list, land use, threats, etc.) were collected. There were distinguished 89.968 cartographic polygons with 53 types of habitats occupying the area of 434,924 ha. By habitat groups, forests make up 62%, grasslands 18%, bogs, mires and fens 6%, inland waters 13%, and coastal habitats and inland dunes 1%. Overall, the habitats of EU importance would occupy 6.66% of the country's territory.

The database contains more than seven million habitat field research records. GIS data on the EU natural habitats distribution in Lithuania are published in the spatial information portal of Lithuania (*geoportal.lt*).

The habitat inventory material has been employed in the following areas: i) setting of a favourable conservation status for each habitat type, including favourable reference value for range and area, ii) development of a surveillance scheme at national level for the habitat types of community interest, which will help to provide objective data for the implementation of Art. 17 of the Habitats Directive, iii) appliance of the data on the EU natural habitat areas across the country and their status while performing environment assessment procedures; iv) employment of the material as the basis for the implementation of the Lithuanian Rural Development Programme 2014–2020 measure "Agrarian environment protection and climate" (activities "Specific grassland management" and "Extensive wetland management"); v) specification of the boundaries and areas of Natura2000 sites and national protected territories by establishing appropriate protection measures, development and implementation of the national biodiversity strategy and action plans, preparation of other documents on biodiversity conservation, revision of the occurrence of rare plant species, etc.

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Comparative assessment of the conservation status of *Schenkia spicata* (*Gentianaceae*) in the Europion Union and in Ukraine

Gentianaceae is a family of vascular plants comprising 87 genera and nearly 1700 species (Struwe et al., 2002). *Schenkia* Griseb. is a genus of this family, that include five annuals or biennials herbaceous species only (Mansion, 2004). In the flora of Ukraine the genus represents *Schenkia spicata* (L.) Mansion that occurs in damp sandy or grassy places near the sea. Largely the species grows in Mediterranean and Black Sea countries of Europe (Portugal, Spain, France, Italy, Greece, Bulgaria, Romania, Russia, Turkey etc) and Africa (Algeria, Libya, Morocco, Tunisia) as well as in Asia (Russia, Azerbaijan, Georgia, Iran, Jordan, Syria, Afghanistan). *S. spicata* is naturalized in North America and Australia.

We conducted a comparative assessment of the conservation status of *S. spicata* in the Europion Union and in Ukraine. Despite the fact that the number of localities of *S. spicata* is limited in the world, it is not included in the Regional Red Lists in any country. All data on distribution of species in Ukraine were summarized and conducted mapping of the known localities. Discovered that in Ukraine *S. spicata* grows rarely on wetlands, on the banks of saline lakes and estuaries, and salt marshes in the coastal regions of the country and the Crimea (Shiyan, 2014). The major threats for this species are habitat loss and degradation mainly caused by building on the coast of seas and erosion, as well as climate change (Gladka, Shiyan, 2012; Shiyan, 2014). In 2015 – 2016 were made proposals to the appropriate Committee of the Ministry of Ecology and Natural Resources of Ukraine for the inclusion *S. spicata* to the next edition of the Red Data Book of Ukraine.

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Conserving vascular plant species at regional level: realisation of 2nd editions of three regional Red Books in Central Russia

Red Book is a legal document that includes taxa protected on the legislative level. We analysed sections "Vascular Plants" of 1st and 2nd editions of Red Books of 3 neighboring regions – Republic of Mordovia, Penza region, Ulyanovsk region. The most significant changes in taxa number were indicated for angiosperm plants. In the Republic of Mordovia the number of angiosperms in 2nd edition of the Red Book has decreased from 162 to 155 taxa. In the Penza region and Ulyanovsk resion it has increased by 41 (from 144 to 185) and 19 (from 188 to 207) taxa respectively. The important indicators of the efficiency of the Red Book maintenance are: a) the number of taxa, rarity category of which has been changed from 0 (possibly extinct) to the lower category of taxon rarity (1, 2, 3, 4 or 5), b) the number of taxa, which have retained the rarity category 0, c) the number of taxa new for the 2nd editions of the Red Books with the rarity category 0. For Mordovia this ratio is 6(a)–3(b)–1(b), for Penza region: 0(a)–2(b)–7(c), for Ulyanovsk region: 2(a)–7(b)–4(c). Hence, under equal number of taxa with the rarity category 0 (a+b+c) for 3 regions the highest efficiency of the Red Book maintenance is shown for the Republic of Mordovia. In future, it is advisable to continue the locations inventory and status of rare plant populations and the assessment of extinction risk of taxa in regions according to the IUCN Red List Categories and Criteria, as it was carried out in relation to taxa included in the 1st volume of the Red Book of the Republic of Mordovia. On example of three regions it was shown that publications and materials of herbarium collections were not taken into account completely during the preparation of the second editions of regional Red Books. The inaction of legislative and municipal agencies in relation of the rare plants conservation was observed. Over the last 20 years, government agencies have not taken a decision on the establishment of new Protected Areas.

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The condition of protected plants in Kaunas Botanical Garden

Until 2015 in Kaunas Botanical Garden of Vytautas Magnus University in Medicinal Plants, Dendrology and Floriculture Sectors and Park there were 59 species plants, which are recorded in the Red List of Lithuania. 2012-2016 the phytopathological conditions of these plants were examined. 25 species fungus were detected on 21 species plants. Mostly it was powdery mildew and rust. Diseases were detected on these plants: powdery mildew: on *Arctium nemorosum* Lej. (*Golovinomyces depressus* (Wallr.) V.P. Heluta), on *Astrantia major* L. (*Erysiphe sp.*), on *Dracocephalum ruyschiana* L. (*Neoerysiphe galeopsidis* (DC.) U. Braun), on *Hypericum hirsutum* L. (*Oidium sp.*), on *Laserpitium latifolium* L. (*Erysiphe heraclei* DC.), on *Polemonium caeruleum* L. (*Golovinomyces orontii* (Castagne) V.P. Heluta), on *Qercus petraea* L. ex Liebl. (*Erysiphe alphitoides* (Griffon & Maubl.) U. Braun & S. Takam.), on *Salix repens* L. (*Erysiphe adunca* (Wallr.) Fr.), on *Salvia pratensis* L. (*Golovinomyces salviae* (Jacz.) M. Scholler, U. Braun & Anke S.), on *Trifolium rubens* L. (*Erysiphe trifolii* Grev.).

Rust: on *Agrostemma githago* L. (*Puccinia arenariae* (Schumach.) J. Schröt.), on *Allium ursinum* L. (*Puccinia porri* (Sowerby) G. Winter.), on *Betula humilis* Schrank (*Melampsoridium betulinum* (Pers.) Kleb.), on *Dianthus arenarius* L. (*Microbotryum dianthorum* (Liro) H. Scholz & I. Scholz), on *Gentiana cruciata* L. (*Puccinia gentianae* (F. Strauss) Link), on *Salix repens* (*Melampsora epitea* Thüm.).

Other diseases: on *Agrostemma githago* (*Peronospora dianthi* de Bary), on *Arnica montana* L. (*Cylindrocarpon sp.* and *Entyloma arnicale* Ellis & Everh.), on *Dianthus arenarius* L. and *D. borbasii* Vandas (*Mycosphaerella dianthi* (C.C. Burt) Jørst.), on *Hedera helix* L. (*Trochila craterium* (DC.) Fr. and *Colletotrichum trichellum* (Fr.) Duke), on *Polemonium caeruleum* (*Phyllosticta polemonii* A.L. Sm. & Ramsb.), on *Prunella grandiflora* (L.) Scholler (*Septoria brunellae* Ellis & Holw.), on *Salix myrtilloides* L. (*Sphaceloma murrayae* Grodz. & Jenkins).

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Invasive *Phytophthora spp.* pathogens of woody plants of Lithuanian flora

Environmental changes during the last decades have created favorable conditions for new invasive tree-damaging fungi species spreading. In recent years in Europe aggressive *Phytophthora spp.* pathogens causing stem cancer for woody plants spread; they also provoke branch desiccation, leaf injuries, discoloration, root rots. About 60 species of *Phytophthora spp.* are known in Europe. It is considered that the synergetic interaction between rot caused by *Phytophthora* genus pathogens and climate change is the main reason for European forest (*Fraxinus spp., Quercus spp., Alnus spp.*) loss.

During 2010–2012 the signs of injury of *Phytophthora spp.* were detected on Lithuanian flora plants growing at city greenery of Lithuanian parks, forests of natural ecosystem and riversides: *Acer platanoides, Alnus glutinosa, Betula pendula, Populus tremula, Quercus robur, Salix caprea, Sorbus aucuparia*. These plants were with thin crowns, stems were marked with bleeding bark canker, the accretion of these plants was smaller considering to these healthy plants growing aside. Mostly appeared individual injured trees, however at two parks (at Southern and Central part of Lithuania) were detected 20–30% of injured *Alnus glutinosa*. The genetic studies were carried out on wood samples of injured plants and also mostly on injured *Alnus glutinosa* and on soil of its root zone. All analyzed samples were positively recognized by *Phytophthora* specific probe during real-time PCR which proved the presence of pathogens in environmental samples. *Tilia* is noticed to be widely spread at city greeneries. At this time *Tilia* can be presented as to be mostly resistant to these pathogens.

For the purpose of restraining the spread of these pathogens it is advised not to used water on seedlings from the open water ponds (rivers, lakes); after noticing plant injuries – exterminate them, planting trees in the soil were injured ones were grown should not be attempted for three years.

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Conserving Plants of Aotearoa New Zealand

New Zealand is a world biodiversity hotspot with a high number of endemic plant species (83% of the flora) due to our isolation from other landmasses. Almost 40% of the flora is regarded as threatened due to the impact of introduced browsing mammals (New Zealand was a mammal-free environment dominated by birds before human colonisation), the introduction of exotic plants (some of which are serious weeds) and habitat loss. New Zealand has no legal protection for plants and threatened plant conservation is not coordinated at the national level. Despite these barriers the New Zealand Plant Conservation Network (NZPCN) has raised awareness of threatened plants in New Zealand and I will present work currently underway to coordinate threatened plant recovery based on a partnership model with the Department of Conservation, the Botanic Garden network of New Zealand (BGANZ) and Maori (indigenous people of New Zealand).

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Resources and stability of wild medicinal plant species of Belarusian-Valdai province

Now an actual problem in the study of the flora is the sustainable use of its objects. In this connection, it is promising to estimate the resources of medicinal plants, their restoration and the degree of sustainability of species, as well as the scientific justification for possible annual volumes of harvesting of raw materials.

Thereby an eco-phytocenotic and resource analysis of 9 species of wild medicinal plants especially important for economics and different in ecology and biology on the territory of the Belarusian-Valdai province was made. The studied species were *Achillea millefolium* L., *Acorus calamus* L., *Bistorta major* S.F. Gray, *Comarum palustre* L., *Ledum palustre* L., *Menyanthes trifoliata* L., *Potentilla erecta* (L.) Raeusch., *Vaccinium myrtillus* L. and *V. vitis-idaea* L.

As a result of the processing the received data, the productivity of the air-dry raw materials was determined for bines (*Achillea millefolium* – 12,74±1,36 g/m^2, *Ledum palustre* – 44,83±4,03, *Vaccinium myrtillus* – 128,25±9,14, *V. vitis-idaea* – 77,13±4,51), rhizomes (*Acorus calamus* – 1242,03±83,33, *Bistorta major* – 287,24±22,58, *Comarum palustre* – 32,56±6,16, *Potentilla erecta* – 145,64±20,03), leaves (*Menyanthes trifoliata* – 30,71±3,59, *Vaccinium myrtillus* – 12,95±2,01, *V. vitis-idaea* – 61,67±5,26).

Depending on the speed of recovery of biometric and production parameters the investigated species were divided into 3 groups of stability: species with high degree of stability (high recovery rate – 1-2 years) – *Comarum palustre, Menyanthes trifoliata*; with intermediate (intermediate recovery rate – 3-4 years) – *Achillea millefolium, Ledum palustre*; with low degree of stability (low recovery rate – more than 4 years) – *Acorus calamus, Bistorta major, Potentilla erecta, Vaccinium myrtillus, V. vitis-idaea*.

Their total biological resources, exploited resources and recommended volumes of annual harvesting on the territory of the Belarusian-Valdai province were calculated on the base of our original algorithm of regional estimation of resources: *Achillea millefolium* – 0.23, 0.12 and 0.03 thousand tones, respectively; *Acorus calamus* – 0.55, 0.27 and 0.04; *Bistorta major* – 0.03, 0.02 and 0.00; *Comarum palustre* – 0.73, 0.36 and 0.12; *Ledum palustre* – 2.87, 1.44 and 0.36; *Menyanthes trifoliata* – 1.20, 0.60 and 0.20; *Potentilla erecta* – 0.13, 0.06 and 0.01; *Vaccinium myrtillus* – 12.42, 6.21 and 0.69; *V. vitis-idaea* – 6.40, 3.20 and 0.46, respectively.

The obtained data can serve as a basis for the development and subsequent implementation of measures and recommendations for the sustainable use of plant resources of the studied species.

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Dendroflora of the Bulgarian part of Rhodope Mountains and its conservation

Rhodope Mountains cover an area of 14743 км^2, 83% of which is on Bulgarian territory or approximately 13.3% of the country's territory. The current study aims to characterize the unique flora of Bulgarian Rhodopes and to gather information for conservation-significant plant species. We found totally 283 tree and shrub species belonging to 117 genera and 51 families. It represents 65.2% of all species, 78.5% of all genera, and 83.6% of all families of Bulgarian dendroflora. We present a floristic analysis which summarizes data of species distribution across the Western, Central and Eastern Rhodope floristic sub-regions and their floristic similarity. The analysis of systematic structure of Rhodope dendroflora by divisions, classes, families and genera is done for the whole Rhodope Mountains. Distribution of the tree and shrub species by biological types and life forms (Raunkiaer, 1934) is shown. Dominant life form is Phanaerophyta. The analysis of floristic elements follows the classification of Stefanov (1943). It shows predomination of thermophytes, mezzotherms, and microtherms from the mountain center, but prevailing part of the tree species are stationary plants. We also present analysis of floristic elements by the adapted for Bulgaria classification of Walter (2012) which shows predomination of Mediterranean elements, followed by European floristic elements. Analysis of the altitudinal distribution of tree and shrub species was also done.

Conservation significance analysis of studied species compares data from the Bulgarian Red Book (Volume I, Plants, 1984; Volume I, Plants and Fungi, 2015), The "List of Rare, Endangered and Endemic Plants of Europe" (1983), The „1997 IUCN Red List of Endangered Plants" (1998), as well as from Bulgarian national legislation acts (Biological Diversity Act, 2002; 2007). Some relic and endemic species for Rhodope dendroflora are presented. We conclude that the dendroflora from Bulgarian part of Rhodope Mountains is the richest among the other floristic regions of Bulgaria with higher conservation status for Bulgaria and Europe. Full systematic list of species from the Bulgarian Rhodopes dendroflora was also published.

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Flora and habitat diversity of Kavuncu Saltmarsh

Turkey attracts attention with high habitat and species diversity and one of the important habitat type is Saltmarsh. Kavuncu Saltmarsh which is relatively small is located at Central Anatolia between Ankara and Eskişehir and under the threat of some factors like expansion of agricultural areas, pollution from pesticides and fertilizers, and drainage of water for reclamation. There are 102 plant taxa of which 30 are halophytes and 9 are endemic. The plant communities defined from the area are as follows: *Thypha domingensis-Phragmites australis, Salicornia perennans, Juncus heldreichianus, Suaeda cucullata-Petrosimonia nigdeensis, Lepidium crtilagineum, Microcnemum coralloides-Aeluropus littoralis, Artemisia santonicum*.

WORKSHOP “TAXONOMY, PHYLOGENETICS & EVOLUTION”

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Features of forming caudex of *Adenium obesum* representatives on pre-generative stage of ontogenesis

Representatives of *Adenium obesum* (Forssk.) Roem. & Schult. are belonging to the group of succulent plants of the family *Apocynaceae* in which the process of forming a broadened basal part of the stem or caudex. It is worth noting that despite the profound information on the origin, taxonomy, phenology of plants of this species, not known information about the anatomical and morphological characteristics of the structure and stages of formation caudex. The purpose of our study was to investigate the anatomical and morphological features of vegetative organs of representatives of *A. obesum* on pre-generative stage of ontogeny. As a result of studies was found that after the germination of *A. obesum* is increasing and thickened hypocotyl, which has a barrel-shaped or fusiform. The thickening of hypocotyl occur medullary- cortical type, thus forming a reservoir to collect water and nutrients. Epicotyl part in stems of studied representatives is much less compared to the thickened hypocotyl. In *A. obesum* diameter of the bottom part of the stem, namely epicotyl area, is about three times more than in the apical part of the stem, which make a smooth transition between the thickened hypocotyl and other less thickened part of the stem. Transport system represented by *A. obesum* open collateral vascular bundles. In immature representatives of *A. obesum* along with the increase in the cortex parenchyma begins to form secondary xylem sufficiently thickened to a greater extent due to the thin-walled parenchyma cells. This is especially noticeable in the main root thickened section where most of the volume takes much parenchyma xylem. In the area of hypocotyl immature plants *A.obesum* is an interesting process offset deep into the pith of the head protoxylem vessels and traffic around them internal phloem bundles, which in our opinion carry more transport and mechanical functions. Formation of *A. obesum* excretory tissue as a mammary not articulated vessel at the stage of germination, indicates that due to the synthesis of metabolites, they are relatively toxic plants. The development of periderm in the early stages of ontogeny of *A. obesum*, in our opinion, is due to the adjustment to life in the arid climatic conditions. So was determined that the caudex of the representatives of *A. obesum* is formed by strong growths hypocotyl and partly is due to thickening of main root and epicotyl part of stem of bordering it.

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The structure of the epidermis of leaves of some species genus *Passiflora* L. in connection with their taxonomy

The *Passiflora* genus is the most extensive one in the family *Passifloraceae* and has about 520 species. The complexity of determination the species of genus by the morphological features prompted many researchers to involve anatomical, ontogenetic, palymorphological, kariological and molecular-phylogenetic data to solve problems of taxonomy of genus *Passiflora*. Today the anatomical structure of leaves of *P. guazumaefolia* and *P. tiliaefolia*, the trichomes types of *P. lobata*, the ontogenesis of stomata of vegetative organs of species *P. edulis, P. foetida, P. minima* are already researched. The molecular-philogenetic researches that were executed indicate the necessity to review the monophyly of genus which requires a thorough analysis of morphological and anatomical features. We have carried out the comparative morphological and anatomical study of epidermis of *P. suberosa* and *P. incarnata* leaves. As the result of the researches of the leaves structure the species *P. suberosa* and *P. incarnate* was established to be characterized by the next common features: hypostomatical type of the leaves lamina, anomocytic type of the stomata, which are evenly distributed over the entire surface at one level with the main epidermal cells, rectilinear outlines and rounded or elongated (in the vein zone) projections, well-developed wax, which is often irregularly formed – more on the abaxial side of the leaf. However, analysis of the data revealed that species are clearly distinguished among each other by the features of leaves surface structure. The species *P. suberosa* differs from the species *P. incarnata* in the existence of the pubescence. Some species has scattered one, while others have both surfaces of leaf not pubescent. Beside the anomocytic type of the stomata complex in *P. suberosa* is observed anisocytic type, and *P. incarnata* – paracytic type of the stomata complex. According to some authors, the existence of different stomata types is an additional diagnostic feature to distinguish species. Furthermore, the species differ one from another by the type of relief. The relief is tuberous in *P. suberosa* and it is reticulated in *P. incarnata*. This feature is also diagnostic for representatives of many taxonomic groups. In our opinion, the obtained original data of anatomical investigation of leaves *P. suberosa, P. incarnata* complements the morphological characteristic of these species and can serve as additional features for their identification.

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Morphological variability of *Consolida regalis* Gray seeds of the South-Eastern and Central Europe

The main aim of this work was to analyze the morphological variability of *Consolida regalis* Gray (common name Forking Larkspur) seeds from the South-Eastern and Central Europe. A review of available literature showed scarcity of data on seed sizes and a complete lack of information describing the morphological variation of *C. regalis* seeds in the geographical gradient. Therefore, the main aim of the study was to analyse the morphological variability of *C. regalis* seeds from South-Eastern and Central Europe. Material to work were larkspur's seeds, collected during expeditions spanning 2012-2014 from 29 sites located in Bulgaria, Romania, Moldova and Poland. Four biometric traits were analyzed: length, width, perimeter and area of the seed. The pictures of the seeds surface structure and sculpture were made using a scanning electron microscope (SEM). The presented results show differences in biometric traits and the seed sculpture across the latitudinal transect. There was a trend observed of an increase in the length, the width, the perimeter and the area of the seeds towards the northern border of the geographical species range. Besides the geographical factor, the morphological variation of larkspur seeds was affected by environmental conditions (mainly temperature) in which plants grew and availability of habitat resources.

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Investigation of structure of generative and vegetative sphere of *Conophytum aequale* (*Aizoaceae*) and its importance for taxonomy

Conophytum (*Ruschioideae*) with app. 100 species is unusually large group of arid flora and considered taxonomically complex. Species number still varies. Debatable is differentiation of species and subspecies. Now there's still no detailed research of anatomy and morphology of *Conophytum* flower, which exactly can help to define its relations with other genera *Aizoaceae*. Object of research is *C. aequale* L. Bolus. For the first time studied vascular-anatomic structure of flower during flowering. Conically united leaves forming a fishtail body – corpuscles of cordate shape. Leaves are xeromorphic. Outside of epidermal papillae is crystalline layer covered with a thin cuticle layer and epicuticle wax layer. As most *Ruschioideae*, flower *C. aequale* has double perianth, multipetalous corolla, 5-sepal calyx, multistaminate androecium, 5-carpels gynoecium. Typical is formation of petal-staminal tube, but tube and column length several times longer than ovary size. Ovary completely immersed in the corpuscles thick. At *Conophytum* developing additional protection mechanism of generative sphere through ovary deepening in the thick of vegetative body. Corolla attracting pollinators, while calyx loses its protective function and becomes very thin, almost filmy. Calyx looks like elongated sheath, in which lies petal-staminal tube, sepals separated only outside and are 2-3 mm long. Inferior ovary with 5 carpels which congenial fused to each other. Gynoecium syncarpous. Placentation basal-parietal. In apical part of each nest is developing false median septum that bisects it so that visually observed on cross section no 5 but 10 nests. Above carpel's edges merge to form ventral channel. Ovary roof convex in the shape of pentagon. Between the ovary roof and basis of petal-staminal tube lies ring of lofomorphic nectaries. Ovary of *C. aequale* homologous to ovary of *Lampranthus haworthii* and *Delosperma echinatum* studied before, where was shown that formation of inferior ovary *Ruschioideae* goes by invagination of receptacle. In ovary wall *C. aequale* also found loops of receptacle bundles, showing its invagination. Deformation of carpel so that their ventral parts occurred in basal-parietal position, dorsal parts become shorter and apical only slightly deformed. By the ovary's structure *C. aequale* occupies an intermediate position between *Delosperma echinatum* and *Lampranthus haworthii*. Degree of placentas displacement is intermediate between *Delosperma* (basal) and *Lampranthus* (parietal) placentation type.

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The variability of the leaf shape *Plagiothecium nemorale* complex in the Central and Eastern Europe

In Europe, the genus *Plagiothecium* Schimp. is represented by 13 species (Hill et all 2006) and *Plagiothecium nemorale* (Mitt.) A. Jaeger is one of them. Together with *P. succulentum* (Wilson). Lindb. and *P. cavifolium* (Brid.) Z.Iwats. consists of *Orthopryllum* Jedl. sections (Ochyra et all 2003). These species are considered to be highly variable and *Plagiothecium nemorale* is often described as a complex. All the studies of the genus *Plagiothecium*, so far have provided no clear criteria to distinguish *Plagiothecium nemorale* from other species (Jedlička 1948, Iwatsuki 1970, Lewinsky 1974, Hemerik 1989). Despite the described high variability of this taxon, to date the European literature (Hill et al. 2006) does not distinguish units at the lower level of this species.

Absence of detailed research was the reason for undertaking comprehensive studies of the intraspecific variability of *Plagiothecium nemorale* complex in Europe.

The conducted study was based on the material deposited in 16 herbaria from 6 countries in Central and Eastern Europe. The morphological study is based on the analysis of 6 selected characteristics of the *Plagiothecium nemorale* leaf. The following values were calculated for the tested samples: Md – median; Min – minimum value; Max – maximum value and VC – coefficient of variation, and the principal component analysis (PCA) was performed.

The results obtained show that the shape of the leaf and the length of both costae of this taxon are very variable. The PCA analysis divides the tested specimens into readily discernible groups and indicates their most discriminating features, as well as points to the need for more in-depth research on this topic.

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The Seed Morphology of *Atriplex* L. (*Chenopodiaceae*) genus Sect. *Atriplex* taxa in Turkey

The genus *Atriplex* L. includes 17 taxa that represented in 5 sections (i.e. sect. *Teutlioides*, sect. *Stylosa*, sect. *Atriplex*, sect. *Teutliopsis*, and sect. *Sclerocalymma*) in Turkey. Sect. *Atriplex* includes three taxa, which are *Atriplex hortensis*, *A. sagittata*, and *A. aucheri* in Turkey. The seed structure and morphology are very important taxonomic characteristics of the *Chenopodiaceae* family. For this reason, with this study it was aimed to determine the seed macro and micromorphology of these species.

Seeds materials were collected from different provinces in Turkey, between 2011 and 2016. Macromorphological data were provided by a stereo-trinocular microscope investigation. Micromorphological data of seed coats were obtained by scanning electron microscopy (SEM).

In the studied taxa, seeds are commonly heteromorph (dimorph or trimorph), brown and black colored. Brown seeds are orbicular, flattish or disk like, and dull, radicula distinctly longer than cotyledon. Black seeds are semi-globose, smaller, and lustrous, radicula shorter or equaling to cotyledon. In *A. aucheri*, the black seeds have two different morphology; type-1 is bulging outward from the sides, type-2 is bulging outward one side of seed and other side is sunken. Seed coat micromorphology in brown seeds is regulate, but in black seeds there are some differences between species. The black seeds have psilate ornamentation in *A. hortensis*, regulate ornamentation in *A. sagittata*, and verrucate ornamentation in *A. aucheri*.

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Taxonomical revision of genus *Kali* Mill. (*Chenopodiaceae*) in Turkey

The aim of the study was to determine morphological, karyological, taxonomical characteristics and distribution of the species of genus *Kali* in Turkey. For this reason *Kali* specimens were collected on both flowering and fruiting periods from known and discovered localities in Turkey between 2011 and 2016. Collected specimens and specimens in herbaria were investigated for the study. *K. dodecanesica* was recorded as a new record for flora of Turkey. Presence of *K. tamamschjanae* was confirmed. Chromosome number of all taxa determined, except for *K. tamamschjanae*, which could not be germinated. Chromosome numbers of *K. turgidum* and *K. tragus* were reported first time from Turkey. And chromosome number of *K. tragus* subsp. *pontica* and *K. dodecanesica*, were reported first time for science. Detailed descriptions for all accepted taxa based on Turkish specimens were comprised. Phylogenetic relationships of the taxa are also studied based on cpDNA psbB-psbH regions sequences. Monophyly of the genus *Kali* is verified with phylogenetic analysis based on cpDNA psbB-psbH regions sequence data.

WORKSHOP
“ECOLOGY, ENVIRONMENT & GLOBAL CHANGE”

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Potential frost resistance of the species from *Exochorda* Lindl. genera in conditions of the Right-Bank Forest-Steppe of Ukraine

Winter hardiness of woody plants is one of the main biological characteristics that define the mechanisms of plant adaptation to new conditions during their introduction. The degree of frost resistance is closely associated with water status changes and ice formation process that are running in woody plant tissues. Therefore, determination of potential frost resistance is a key initial stage of woody plants introduction trials.

The objects of the study are five species from *Exochorda* Lindl. genera, namely: *E. giraldii* Hesse, *E. racemosa* (Lindl.) Rehd., *E. korolkovii* Lav., *E. tianschanica* Gontsch. and *E.* × *macrantha* (Lemoine) Schneid. The potential frost resistance is determined during deep calm period (the second decade of January) by the method of direct freezing their annual shoots with subsequent analysis of tissue damage using microscopic anatomical and histological studies, differential thermal analysis and fluorescent microscopy. The results of evaluation of potential frost resistance compared with the field data (actual) winter hardiness, which is assessed by 8-point scale.

By freezing shoots of *Exochorda* species under the temperatures of -30°C are detected the enhancing of tissue injury. The damage coefficient of shoot tops are: *E. giraldii* – 40.6, *E. racemosa* – 59.2, *E. korolkovii* – 73.2, *E. tianschanica* – 52.2, and *E.* × *macrantha* – 52.4 points. According to the scale, all the species got high levels of damage, only *E. giraldii* is damaged averagely. Buds after freezing under this temperature suffered less than shoot tips, and damage rates have not exceed the average level. Middle parts of shoots proved the most stable and only *E.* × *macrantha* specimens showed substantial damage (42.6 points).

By the method of microscopic studies of cross sections of *Exochorda* species shoots due to the influence of low temperatures the most damaged tissues are in core, bark and wood, the least – in cambium. This is extremely important because cambium, as generating tissue, is the most necessary component in the life of woody species, to support growth and regeneration.

Thus, all studied *Exochorda* species can be considered as potentially frost resistant. Resistance of these plants is confirmed by differential thermal analysis and the features of the anatomical structure their annual shoots. These peculiarities provide such processes of ice formation in their shoots that prevent mechanical damage of protoplasts and do not lead to dehydration of tissues.

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Validation of *Heracleum* spp. inhibition *ex situ*

Rapid growth and reproduction, ability to colonize disturbed habitats, short life cycle, early flowering and seeding, production of large quantities of seeds and vegetative propagules, different phenology from native species, disease- and pest-resistance usually govern a successful spread of accidently introduced alien plant species in new territories. Additionally, ecological significance of secondary metabolites in ecosystem interactions recently is approved. Therefore, this study is aimed on research of phytotoxicity of invasive *H. sosnovskyi* and *H. mantegazzianum*, which is likely to be involved in their invasion success. The total phenolics content (TPC) of both *Heracleum* spp. was investigated in terms of their allelochemical activity. Seed of different taxonomic group' acceptors, i.e. perennial ryegrass (monocots) and winter rapeseed (dicots) were germinated *ex situ*.

Heracleum spp. parts and leachate concentration conditioned the TPC in leachates. The highest content of phenolic compounds (87.98 and 92.06 mg mL-1) accumulated in leaf 0.2% leachates of *H. sosnovskyi* and *H. mantegazzianum* respectively, and resulted the lowest germination of both acceptor species. The complete inhibition (0%) was observed in 0.2% leaf extracts of both tested *Heracleum* species due to highest TPC. Strong negative correlations between leachate' TPC and germination of acceptor rapeseed (r= -0.8) and ryegrass (r= -0.7) confirmed TPC inhibition effect on germination. Consequently, the germination response of neighbouring species to invaders allelochemicals might be addressed to regeneration capacity of native plant community. These findings are important to explain variation in the response of native to invasive species at habitat range, though further assessment of allelochemicals impact in situ is required.

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Allelopathic potential of aqueous leachates from *Genista versicolor*

Allelopathy is defined as the beneficial or harmful influence of allelochemicals: phenols, terpenes, flavonoids, fatty acids, steroids and others compounds produced by plants. Once released into the environment they can inhibit the germination of seeds or hamper plant growth.

The vegetation of the Sierra Nevada Mountain (SE of Spain) is distributed according to the altitude in bioclimatic belts, from the thermomediterranean (warmest) to the crioromediterranean (coldest). Between 1,900 and 2,900 m a.s.l the oromediterranean belt is characterized by psicroxerophilous pastures on thin soils and scrub plants on more developed soils, including juniper and other endemic species such as *Genista versicolor* (*Leguminosae*). In this context, we have studied whether *G. versicolor* may prevent the establishment of other species due to an allelopathic interaction.

We used leaves and flowers of *G. versicolor* and topsoil samples taken under this scrub vegetation. Water-soluble compounds were obtained by a cold extraction (25°C) and a hot extraction (100°C). In order to check the potential inhibition of the leachates on the germination and the shoot and root elongation, we used seeds of four herbaceous species: *Arenaria tetraquetra* (*Caryophyllaceae*), *Festuca indigesta* (*Poaceae*), *Dactylis glomerata* (*Poaceae*), and *Lactuca sativa* (*Asteraceae*) and two shrub species: *Reseda complicata* (*Resedaceae*) and *Thymus serpylloides* (*Labiateae*). For each species 20 seeds were sown in Petri dishes. Afterwards 20 ml of the corresponding leachates, or distilled water or saline solution (NaCl 0.5%) as controls were added. The dishes were moved to a germination chamber with temperatures 19°/5°C and a photoperiod of 14/10 h light/dark. The germination was measured daily during a 20-day period and the last day both radish and shoot length were measured. Analysis of volatile compounds was performed using a GC-MS and the obtained mass spectra were compared with the spectra from the NIST-Year 2008 library.

A number of compounds with recognized allelopathic activity have been identified, as well as a remarkable reduction in the germination of seeds and a reduction in the length of shoots and roots of all the tested species. The results suggest that allelopathy could contribute in some way to prevent the establishment of vegetation in areas with *Genista versicolor*.

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The phytoremediation potential of aquatic macrophytes

The exponential increase in the use of heavy metals, in several industrial and technological applications such as electroplating and mining operations, led to dramatic changes in the amount of these toxic metals released into the aquatic environments. It is known that physical and chemical remediation processes have disadvantages such as high costs, low efficiency and/or risk of harm to biota. However, bioremediation of polluted water bodies by using aquatic macrophytes have been more pronounced recently. In this study, the phytoremediation potential of aquatic macrophytes such as *Pistia* spp., *Azolla* spp., *Ceratophyllum* spp., *Eichhornia* spp., *Lemna* spp., and *Myriophyllum* spp. against heavy metal pollution are reviewed and compared.

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Nanopreparations and protection of green spaces in Kyiv

Due to the limited usage of pesticides in urban areas appears a question of finding alternatives to providing plants with necessary nutrients in an accessible form avoiding negative impact on residents. This alternative can be multi-component nanopreparations. Analysis of the State Register of Pesticides and Agrochemicals permitted for use in Ukraine shows that the market of our country amounts about 120 kinds of biological products represented by producers from 20 countries, of which includes about 97% of the total amount for agriculture and only 3% - greenery. According to the list of items of State Register nanopreparations of Ukrainian production presented by 19 manufacturers. For determination of the most efficient preparations which certified and approved for use on the territory of Ukraine, to the formation and preservation of green spaces we analyzed the changes of vitality, intensity of formation of aerial parts of deciduous and coniferous plants, their lesions by pests and pathogens, processes of rhizogenes of herbaceous plants cuttings, germination and seedling vigor of lawn grasses seeds under the influence of nanopreparations. Determined that germination and vigor of seeds of five varieties of plants *Lolium perenne* L. of Ukrainian selection varies and depends on its mass, structure and water quality. Found that the most effective preparations among analyzed which contributes to growth indicators of germination and vigor seeds of *Triticum aestivum* L., *Festuca rubra* L. and *Agrostis alba* L. are `Stympo`, `Regoplant`, `Megamiks`. Rate of apical growth of root length and seedling of *Darmera peltata* (Torr. ex Benth.) Voss) increases compared with control by actions of plant growth regulators. It was fixed an extensive development of aerial parts also has increased average amount of formed leaves, leaf plates diameter and length of leafstalks.

On the territory of green space of the Pechersk utility company for maintenance of green spaces in Kyiv were formed small-plot research areas. Obtained results allow providing a higher level of plantings preservation on areas of green spaces in Kyiv. It was evaluated that the largest size of lateral shoots of plants *Piceae pungens* Engelm. formed in conditions of complex usage of bio-stimulants `Regoplant` and `Stympo` compared with control.

It was concluded that intensification processes of shoots tumors in experimental plants testify of accelerated metabolism, increase immunity and resistance to adverse actions to environment factors.

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Habitats of Ukraine offered for inclusion in Resolution 4 of the Bern Convention

The signing of an association agreement between Ukraine and the EU has opened up great prospects for improvement of national environmental legislation and bringing it closer to European standards. Through this an activity on environmental networks development, including the Emerald Network, which in the future can be integrated network NATURA 2000, has been significantly intensified. However, existing lists of habitat types from Resolution 4 of the Berne Convention and Annex I of the Habitat Directive, which are the basis for the development of the Emerald Network and selection of the Emerald sites, unfortunately not fully cover all habitats of Ukraine needing protection at European level. This concerns, above all, unique habitats with significant proportion of endemic elements that are absent in Europe. In view of this, we are set a goal to identify those habitats that are promising to be included in Resolution 4 of the Berne Convention, and in the future may also to be included in Annex I of the Habitat Directive. For this purpose we have made an inventory of all habitat types of Ukraine needing of protection at European level and analyzed their representation in the Resolution 4 of the Berne Convention. The analysis revealed 6 types of habitats promising for inclusion in this resolution: Crimean garrigues (group of habitats F «Heathland, scrub and tundra»); pine forests on chalk (group of habitats G «Woodland, forest and other wooded land»); volcanic-mud salt marshes (group of habitats H «Inland unvegetated or sparsely vegetated habitats»), as well as three habitat complex from group X: pods (depressions) of Steppe zone; karst craters of Crimea; karst relief elements ("verteby", "govdy") of Western Podillya. For a number of habitats that are included in the Resolution we propose to add new "Ukrainian" subtypes.

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Ecology and biology of invasive *Elaeagnus angustifolia* L.: recent studies in the Forest-Steppe zone of Ukraine

Russian olive (*Elaeagnus angustifolia* L.) is an invasive species, which has extreme invasion potential. In Ukraine it is spread through both Steppe and Forest-Steppe zones and creates favorable soil conditions for ruderal flora expansion, which replaces aborigine steppe species. Russian olive is not limited by high temperature, lack of water or light availability; it is tolerant to strong wind, flooding, soil salinization or alkalization.

The studies were done in four different areas of the northern and western boundaries of its area. Four populations were described by 5 parameters, such as height, diameter, age, branchiness, and canopy diameter. It was revealed that 5 types or parameter combinations are characterized by power law dependence, which is height and diameter, height and age, height and branchiness, diameter and age, and canopy diameter and age. In contrast, three reactions were linear; they are height and canopy diameter, diameter and canopy diameter, and, finally, age and branchiness.

Age analyses indicated that northern populations are stable but in the long-term perspective they may became old and regressive, as there are absent juvenile plants. They have also less potential to expand further to the north because sod-podzolic silicate soils, which are located there, suppress aggression of *E. angustifolia*. The western population was much more numerous and extremely progressive, as more than 70% of the population was represented by young plants, and old individuals were almost absent.

Analyses on allelopathic activity by Neubauer & Schneider revealed that there were differences between plants, which were grown under and beyond the tree canopy that can indicate that *E. angustifolia* does have allelopathic ability. Among four different studied parameters, which are length and dry mass of aboveground and underground parts of plant, only one had statistically significant difference. It is average length of the above ground part of plant, which was 18.2 cm and 18.7 cm under and beyond the canopy respectively. The survival rate among the experimental plants slightly differed and corresponds 72% and 84% under and beyond the canopy respectively. To verify these results it will be relevant to do phytoindication analysis by Turboveg software that is planned to conduct in the near future.

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The LIFE+ Project "Innovative silvicultural treatments to enhance soil biodiversity in artificial black pine stands"

SelpiBioLife is a project under the category Biodiversity, for innovative or demonstration projects that consider biodiversity issues within the LIFE Nature and Biodiversity strand presented by 5 partners. The main objective of the project is to demonstrate the potentiality of an innovative silvicultural treatment to enhance the level of biodiversity in the soil. Soil plays a fundamental role in forest ecosystems being closely related to the root system, the dynamic of the succession and is home to a great biodiversity. This is analyzed considering forest functionality and soil components (flora, fungi, bacteria, mesofauna, nematods and microarthropods), according to the EU 2020 Biodiversity Strategy (2011/2307(INI)), the European Atlas of Soil Biodiversity (JRC, 2010) and the Strategic Action Programmes (SAP) of the Italian National Biodiversity Strategy (SNB), in the framework of the 2013 national priorities.

In particular, the main purpose of the project is to evaluate the effects on forest functionality and soil biodiversity of selective thinning (changing both the horizontal and vertical forest structure and then the canopy coverage), compared to traditional thinning from below (not able to modify crown competition) and to none management. The two pilot areas are localized in Pratomagno and on Mount Amiata (Tuscany, Italy) where in the past silvicultural treatments were not carried out. The goal is to demonstrate that the selective thinning not only improves the growth rate of the trees and the stability of the stands but increases the overall biodiversity.

The main activities, objectives and preliminary results of the Project SelPiBioLife with emphasis on plants and fungi are here reported.

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Expansion of most dangerous invasive plant species in Belarus

One of the main threats to biological diversity now is invasive alien species, the expansion of which also leads to serious environmental, social and economic problems. Aggressive invasive species are replacing the native species from their habitats; negatively transform natural complexes, and the environment. Some of them can be dangerous to human health; others can cause direct economic damage.

More than 200 species of alien plants have already permeated on the territory of Belarus since the second half of the 20th century. The registration and collection of information on their distribution has been carried out since 2001 as part of the Plant State Cadastre of the Republic of Belarus. A full mapping and recording of all populations of invasive species in Belarus has been carried out since 2008. Later (from 2011), the national monitoring system for these species began to function.

The most dangerous invasive species in Belarus are: *Heracleum sosnowskyi* Manden., *Solidago canadensis* L. and *S. gigantea* Ait, *Echinocystis lobata* (Michx.) Torr. et Gray), *Acer negundo* L., *Robinia pseudoacacia* L., and *Impatiens glandulifera* Royle. Widely distributed in Western and Central Europe *Heracleum mantegazzianum* Somm. et Levier is rare, mostly in the western part of Belarus. Hybrids of these two species are represented somewhat more broadly.

On this time, over 11000 populations of these species have been identified on the territory of the country. The most widely represented giant hogweed (3100 populations) on square 1968 ha, mainly in northern and central Belarus. Also *Acer negundo* (4.039 populations) is a widespread invasive species throughout the country. Complex of *Solidago canadensis* and *S. gigantea* began to actively distribute from the end of the 20th century, especially in the central part of the republic, and now more than 4040 populations were registered. *Echinocystis lobata* was first planted as a planting plant in the early 80s of the last century, already has more than 1200 populations of natural origin. Its main distribution channels are the river floodplains.

Less widely distributed are *Robinia pseudoacacia* (about 780 places), mainly in southern-west part of Belarus and *Impatiens glandulifera* (about 100), which is just beginning an active phase of its expansion.

In addition to registering and monitoring invasive species, we develop specific recommendations and action plans, and also simulate the dynamics of the expansions and develop prognosis.

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The biotop's (habitat's) organization of the territory Upper Dnister's Plane (Precarpathians region, Ukraine)

The general conception of the nature conservation and protection in Ukraine is changing from plant's and population's protection to habitat's (biotop's) approaches in this area. This way based on the Habitats Directive (1992) principles. This method is just and relevant in the establishment of nature protection area for example National Native Park.

The experience of the pilot project in the Ukraine Carpathians "Introduction of the European Standards and Methods for the Habitat Identification and Classification in Ukraine" (2010-2012 years), where I was participated, has been used. The biotop's structure of the territory Upper Dniester's Plane (Precarpathians region of Ukraine) is presented. It consists of 41 types of biotopes according the methodology for their selection and identification. This methodology has been tested in the named project. The main idea of this method: the plant cover and characteristics of their plants communities used as faces (physiognomies) of the habitats. The description of vegetation was made with traditional methods (Braun-Banquet's approach).

It is very important part of work because on this territory will be organized the National Native Park "Dniesterskiy". And It is one of steps on the Ukrainian way to approach European Nature Conservation.

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Landscape approach to ecosystem services assessment in the field of nature conservation

Formation of a network of nature protected areas is one of the key challenges for the conservation of landscape and biodiversity, habitat of species of wildlife and plant communities. However, in Ukraine the effectiveness of the implementation of this task depends on the following factors: the partial withdrawal of natural land and related resistance of the powerful industry structures, landowners and land users; the difficulties with the formation of a representative network of natural protected areas due to the lack of applicable researches; the limitations of modern methodical support in terms of design and creation of a network of environmental facilities; the low level of awareness of the public about the advisability of wildlife protection and reservation of certain areas; "artificial" improvements of indicators of reserved areas due to an unsystematic increase in the number of natural reserve fund objects, with a loss of quality in their organizational and functional structure, etc.

All these problems are largely related to the low level of information support of the decision-making process, which indicates a need for new "pragmatic" directions, allowing filling the information vacuum regarding the ecologic and the economic value of certain natural systems.

The ecosystem services concept is an interface that aims at improving all stakeholders understanding about the benefits of nature conservation for society. However, transition of policy to practice remains a major challenge.

One solution to this problem is the use of the landscape ecological approach as a basis. The essence of this approach is the ability to most deeply uncover the potential of the territory in relation to ecosystem services, based on the study of the background of natural and man-altered functional characteristics of natural complexes in their spatial differentiation.

The optimization task, namely, is how to choose and evaluate from a set of ecosystem services those that are best suitable to the landscape organization of the territory and the existing degree of economic development, and are capable of comprehensive cooperation to preserve and increase the ecosystem capacity of a particular territory.

WORKSHOP
“PLANTS & SOCIETY”

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PlantRace – a chance to gain young botanists?

One of the major problems in botany is the lack of young people willing to achieve skills such as plant determination. Many schools and universities offer a decreasing program of determination education – the lack of basic knowledge leads to a lack of interest in ongrowing generations. Active volunteers and specialists in plant knowledge are getting older and the shortage of junior scientists gives a pessimistic view on botanical conservation.

The gain of plant knowledge is often seen as “unsexy“ since it is hard to learn and does not promise good job chances. But of course there are a lot of fascinating issues about plant knowledge: diversity, taste, nutrition, smell, beauty – and when there is an offer of interest, there will be a demand of jobs.

Ideas are needed to get young people interested in learning more about plants and plant diversity. One idea is “PlantRace“, a campaign undertaken since 2015 by the botanical section of the non-governmental organisation NABU, the biggest nature protection organisation in Germany. The “PlantRace”-idea is a copy of the BirdRace-campaign, that has been developed by Plantlife International and is successful in whole western Europe for many years.

In “PlantRace” small teams of at least two and up to four people are in a competition to find as much plant species as possible in a limited time and area. The investigation area is unknown to the participants before. At a given central meeting point, the teams get a closed envelope with the boundaries of the investigation area, which is the same for all teams. All teams have to be back at a given time and hand out their species lists, which are checked on plausibility by a jury. The winning team gets a certificate and a small, funny price.

A difficulty is to find a suitable investigation area: The area has to be large and diverse enough to have room for the operating teams. Protected areas are not allowed, and agricultural areas often offer problems with land users. In Muenster we decided to get a not protected woody area of about one square kilometre with several ponds and verges in it. Municipal administration and hunters have been informed in advance.

First attempts in Muenster (North Rhine-Westphalia in Germany) and in Hungary have been successful and promising. In Muenster more than ten teams of nearly only young people – mostly students from Muenster university – had a lot of fun and found a lot of species.

“PlantRace” proved to be a suitable event to get young people interested and motivated. Preparation and organization are simple, so it could be a promising tool for other countries all over Europe.

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The role of different levels of botanical knowledge in environmental education

The effective conservation of wild plant species will depend on good environmental education based on research result of knowledge elements and real data. The effective education of botanical knowledge must be based on previous knowledge elements which can be found in botanic gardens or in nature close to cities, towns or villages. At the same time education must focus on some local botanical values and plant species of global importance. The research focuses on the rate of knowledge elements about exotic, invasive and local wild plant species in educational programs of university bachelor, master courses and in adult education. The method is key word search, questionnaires and cross thematic analysis. The results of the analysis explore focus points which are sometimes not direct ways to effective, socially supported plant conservation. The presentation shows case studies, thematic weeks and special courses where the botanical knowledge can be distributed. There are good and bad examples which can increase or decrease botanical knowledge elements and can help focusing on successful conservation activities.

Botanical Gardens at universities, as the Botanical garden of Eszterházy Károly University, have the opportunity for coordinating the effective practices, events for education and connect knowledge elements of plant conservation with the ones of taxonomy and ecology, social studies, pedagogy and arts.

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The Global Botanical Portal

According to the targets 15 and 16 of the Global Strategy for Plant Conservation, Institutions, networks and partnerships for plant conservation on national, regional and international levels have to develop. It is very important for training and fruitful work of botanical experts. But, despite the large number of existing scientific and public societies of different levels which limit their activities by geographic regions or thematically (narrow group of plants, the direction of researches, etc.), there isn't any global information resource for botanists of the world still. This greatly complicates the search for the needed information for both professional botanists and students with amateurs. They should check a lot of websites to find posts about open positions, current opportunities for education, new conferences, etc. So, the author of the abstract has created "Global Botanical Portal" (https://gbportal.net/) which aims to decide above described problems. Introduction to the design, structure and capabilities of the resource will be held during the presentation within the 8th Planta Europa Conference.

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"Nature Conservation Research" – a new journal devoted to the conservation of taxa, ecosystems and natural resources

"Nature Conservation Research" is an Open Access, scientific, international, peer-reviewed journal, focusing on 1) the quality and level of scientific investigations carried out in Protected Areas, 2) studies of biological diversity, and 3) biology and ecology of rare and endangered species. It is published by "Fund for Support and Development of Protected Areas" (Russia). "Nature Conservation Research" has its own web-site: *http://ncr-journal.bear-land.org/*. Its publishing activity started in May 2016 with a quarterly frequency. Besides, the journal publishes annually several special volumes, dedicated to certain topics in the field of nature conservation. In its second year now, the journal is already indexed in the following databases: Thomson Reuters (Zoological Record), CrossRef, DOAJ, Russian Science Citation Index (RSCI) and ResearchGate. "Nature Conservation Research" has published four regular volumes so far, as well as two special ones, titled "Rare and endangered species" and "Studies of Red Data Book taxa". Furthermore, in 2017–2018 the Editorial Board plans to publish four more special volumes, devoted to 1) conservation of marine organisms, 2) alien species in Protected Areas, 3) impact of climate changes on nature, 4) usage of camera traps in biodiversity studies. The percentage of accepted manuscripts is 67%. Accordingly, the rejection rate is 33%, including 23% of the manuscripts being rejected on the base of Reviewers' recommendations and 10% of the manuscripts being rejected by the Editors without peer-reviewing. The average time from the receiving of a manuscript to the final decision is 4.7 weeks, and the average time from the receiving of a manuscript to its publishing is 15.8 weeks. There are several tasks in the near future: a) being registered in the Web of Knowledge Core Collection, Scopus and PubMed databases; b) increasing the number of articles written entirely in English; c) extending the international network of authors and reviewers.

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A three-tier survey scheme to monitor the distribution of plants for biodiversity policy evaluation

Surveys of plants and animals are often carried out to answer specific questions. To overcome the problem of shifting data demands due to changes in endangered species lists and environmental laws and regulations, monitoring all taxa of a certain species group can be an alternative. In this paper the authors describe how a citizen science approach in the Netherlands succeeded in monitoring all wild vascular plants, bryophytes and lichens since 1989. Two different methods are used to monitor common taxa and rare taxa. The third tier assures sufficient spatial coverage. All three methods use data from previous years to calculate when a grid cell or taxon needs to be resurveyed. The resulting data set can be used for distribution maps and analysed with occupancy modelling to calculate local and regional annual species trends. Trends and distribution maps are used as material for National Red Lists and the evaluation of nature management, including Natura 2000. Results over the past ten years showed that the method is robust enough for a long-term monitoring project. The principle of using existing data to assign monitoring tasks is efficient, but also a transparent way of communicating with volunteers participating in citizen science, who will find their work more meaningful.

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Rapid response to invasive species in the digital era

Rapid availability of observation data of invasive species is an important means to be able to prevent establishment and spread of these species and to help management for already widespread invasive species. Yet, these data have to be trustworthy and also have to be made available to management organisations fast to be able to adequately diminish the influence of invasive species in the ecosystem.

In The Netherlands a vast majority of botanical observation data is collected in the National Database Flora and Fauna. In this database many private, corporate, scientific and governmental parties are working together to collect data on the distribution of plants and other organisms and recently comprises 100 million observations. These data are not only collected by professionals, but mainly through a network of volunteers (citizen science).

Data from different apps and web portals are send to the National Database. Data quality is assured through a validation protocol. This first automatically checks data integrity and the probability of a species' determination, based upon earlier and nearby observations of the species. Remaining doubtful observations are then manually checked by species group experts. In this way, more than 90% of the data becomes available to different types of end users within a few days after being collected. In the case of invasive species, local managers can rapidly act after receiving an e-mail alert or accessing the data portal.

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