



**The 9th International Meeting and Conference
of Botanic Gardens Network
from the Baltic Sea Region**

***“The new challenges and collaboration tasks
for botanic gardens from the Baltic Sea Region”***

**Under the honorary patronage of Mr. Jarosław Rzepa
Vice Marshal of West Pomeranian Voivodeship**



**PATRONAT HONOROWY
WICEMARSZAŁKA WOJEWÓDZTWA
ZACHODNIOPOMORSKIEGO
JAROSŁAWA RZEPY**



Programme & Abstracts

October 5-8, 2016 Przelewice, Poland

Organizers:

- Dendrological Garden Przelewice
- Polish Academy of Sciences Botanical Garden – Center for Biological Diversity Conservation in Warsaw-Powsin



Co-organizers:

- A. Mickiewicz University Botanical Garden in Poznań
- Thematic Gardens 'Hortulus' near Dobrzyca
- The Council of Botanical Gardens and Arboretums in Poland



Organizing committee:

Chairperson:	Mrs. Beata Osińska (Przelewice)
Vice chairperson:	Professor Jerzy Puchalski (Warsaw-Powsin)
Members:	Assoc. Professor Justyna Wiland-Szymańska Dr. Paweł Kojs (Mikołów)
Secretary:	Ms. Agnieszka Brodzińska (Przelewice) Ms. Katarzyna Misiak (Przelewice)

CONFERENCE PROGRAMME

October 5 (Wednesday)

- From 14.00 Registration of participants.
16.00-18.00 Sightseeing of the Dendrological Garden
19.00 Welcome reception - dinner

October 6 (Thursday)

- 8.00- 9.00 Breakfast
"The new challenges and collaboration tasks for botanic gardens from the Baltic Sea Region"
- 9.30-10.00 Opening the conference
Welcome adresses
- 10.00-11.30 Session I: *Plant diversity – research & conservation efforts*
Chairperson: Professor Marian Saniewski
- 10.00-10.25 Jerzy Puchalski
The National Network of Botanical Gardens in Poland – history, members and activities
- 10.25-10.50 Mats Havström
Integrated conservation of endangered plants in West Sweden. The role of Gotheburg Botanical Garden
- 10.50-11.15 Ruth Aguraiuja
Research and Conservation efforts at Tallin Botanic Garden
- 11.15-11.40 Asta Klimienė
Botanical garden of Klaipėda university: location, landscape, and collections situation
- 11.40-12.00 Discussion
- 12.00-13.00 Lunch
- 13.00-14.20 Session II: *Education, public awareness and tourism*
Chairperson: Assoc. Professor Justyna Wiland-Szymańska
- 13.00-13.20 Göran Allard
A new educational project in the DBW Botanic garden
- 13.20-13.50 Jacob Ohlin
A short presentation of Lund Botanical Garden
- 13.50-14.00 Adrian Augustyniak
Novel microbiological ideas for horticulture

- 14.00-14.20 Katarzyna Misiak
Dendrological Garden in Przelewice – the evolution of concept
- 14.20-14.30 Discussion
- 14.30-15.00 Coffee break
- 15.00-16.00 Session III: *Network collaboration tasks and future plants (discussion)*
Chairperson: Dr. Göran Allard and Dr. Audrius Skridaila

Posters:

Asta Malakauskienė
The Compatibility and Challenges of Old Dendropark Conservation and New Dendrological Exposition Establishment in Kaunas Botanical garden of Vytautas Magnus University

Joanna Jaskulska, Alicja Kolasińska, Roksana Lubkowska, Joanna Markiewicz
Endangered species protection as element of nature education

Anna Rucińska, Jerzy Puchalski, Maciej Niemczyk, Marian Saniewski
Genetic and physiological studies for improvement of ex situ conservation efficiency of Polish endemic plants

Jerzy Puchalski, Adam Kapler, Maciej Niemczyk, Piotr Walerowski, Antoni Krzyżewski, Konrad Woliński, Wiesław Podyma
Long-term seed cryopreservation of rare and endangered polish pontopannonian plant species

- 16.00-20.00 Tour to Dendrological Garden Glinna of the Forest District Gryfino
www.glinna.pl

- 20.00 Gala Dinner

October 7 (Friday)

- 7.00- 8.00 Breakfast
- 8.00-19.00 Tour to Thematic Gardens 'Hortulus' in Dobrzyca near Koszalin
Owner: Iwona Bigońska
www.hortulus.com.pl
- 19.00 Dinner

October 8 (Saturday)

- Departure from Przelewice
Optional: sightseeing of Szczecin

ABSTRACTS

The National Network of Botanical Gardens in Poland – history, members and activities

JERZY PUCHALSKI¹, PAWEŁ KOJS^{1, 2}

¹*Polish Academy of Sciences Botanical Garden - Center for Biological Diversity Conservation in Powsin,
02-973 Warsaw, Poland, e-mail: bgpas@obpan.eu*

²*Silesian Botanical Garden in Mikołów, Poland*

At present in Poland there are 43 institutions included into botanical gardens. All of them are acting in official way as botanical gardens on the basis of the decision of Minister of Environment according to National Law on Nature Protection adapted by the Polish Parliament in 2004. This law regulates all rights and obligations for botanical gardens and secures by the law the protection of their land and plant collections. Nowadays all decisions related to botanical gardens are carried out by the General Directorate of Environment Conservation. Among these 43 institutions rated as "botanical gardens" 18 are classical botanical gardens with various plant collections, 19 arboretums or dendrological gardens holding mainly the collections of woody plants, 4 gardens of medicinal plants and 2 palm houses.

At present 36 of those "botanical gardens" institutions are member of the National Network of Botanical Gardens called "*The Council of Botanical Gardens and Arboretums in Poland*" (acronym ROBIA - www.robias.pl). The national network of botanical gardens in Poland was initiated by Dr. Ludmiła Karpowiczowa - associate professor of botany and director of Warsaw University Botanical Garden in 1972 in the structure of the Polish Botanical Society. After her tragic death in 1973 as a chairman of the Council of Polish Botanic Gardens was elected Professor Aleksander Łukasiewicz serving this function till 1996. During these 23 years the Council of Botanical Gardens was acting as the Commission of Botanical Gardens in the framework of the Botany Committee of the Polish Academy of Sciences. At the end of 1996 the Council of Botanical Gardens comprised 16 members representing directors or curators of botanical gardens. In 1996 the statutes of the Council was changed and from that time the Council of Botanical Gardens was acting as the independent federation of botanical gardens. The chairman of this Council were Professor Jerzy Puchalski (1996-2011) and Dr. Paweł Kojs (2011-2012). The new Council board and the chairman decided to change in 2012 the statutes again and by the court decision the Council of Botanical Gardens and Arboretums in Poland was acting as association of ordinary and honorary members representing - as directors or curators, their gardens. Since 2012 the President of the board is Dr. Paweł Kojs - director of Silesian Botanical Garden in Mikołów. Among 36 ordinary members of national network 11 represent university botanical gardens, 3 - the research institutions of the Polish Academy of Sciences, 2 - the units of the research institutes of the Ministry of Agriculture. 10 member gardens belong to the various local authorities - cities, communities, counties or regional governments and 7 arboretums are the institutions of the State Forests in Poland. The members of the national network are also 3 private botanical gardens. The Council of Botanical Gardens in Poland is the leading official body for all institutions and their role is to coordinate their activity. During 44 years of the network activity 46 annual meetings were organized together with the national or international conferences devoted to diverse research problems, biodiversity conservation, as well as, ecological and nature education.

Integrated conservation of endangered plants in West Sweden – the role of Gothenburg Botanical Garden

MATS HAVSTRÖM

Gothenburg Botanical Garden, Carl Skottsbergs Gata 22A, 413 19 Gothenburg, Sweden

mats.havstrom@vgregion.se

Six plant species endangered in Sweden, i.e. *Dracocephalum ruyschiana*, *Eryngium maritimum*, *Mertensia maritima*, *Pulsatilla vernalis*, *Pseudorchis albida*, and *Stipa pennata* are currently being subject to integrated conservation efforts as a joint effort by the West Sweden County Administrative Board, the National Action Program for Threatened Species and Gothenburg Botanical Garden. In Sweden, in situ and ex situ conservation programs have rarely been integrated, especially for plants. However, rapid changes in maintenance regimes of grazelands and meadows as well as climate change has caused severe decline in biodiversity and population sizes, which calls for rapid action and a more integrated approach to plant conservation. Hence the author has put a substantial and sustained effort in trying to persuade local and regional authorities to enable seed collection from the few stable populations of these species in order to produce viable plants that can be planted out with permission in carefully selected areas.

So far seeds have been collected and plantlets of target species raised at Gothenburg botanical garden in order to create a living gene bank and ambassador plants within the garden. For one species *Eryngium maritimum*, plantlets have also been introduced into two satellite population to their mother population at Vrångö, Gothenburg archipelago. In order to create space for this introduction, *Rosa rugosa* and *Prunus spinosa* were removed in collaboration with the land owner. Monitoring, seedling introduction and continuous removal of competing species will continue until a raise in spontaneous recruitment of seedlings size has been recorded.

Research and Conservation efforts at Tallin Botanic Garden

RUTH AGURAIUJA, ANU KAUR

Tallinn Botanic Garden, Kloostrimetsa Rd.52, Tallinn 11913
ruth.aguraiuja@botaanikaaed.ee; anu.kaur@botaanikaaed.ee

Research and conservation at Tallinn Botanic Garden (TBG) is based on living plant collections, preservation of native plant species and communities within the garden, and on participation in several in situ conservation projects. It also includes more detailed research on reproductive biology and restoration ecology on locally and globally endangered plant species, with ultimate aim to restore their natural populations.

The living plant collections of TBG consist of about 6500 taxa of outdoor plants and over 2000 taxa of indoor plants. Native vegetation of the garden consists of 458 native plant species, including 14 naturally growing protected species. Native communities are represented by floodplaine alder forest (*Humulo-Alnetum incanae*), transitional bog pine forest (*Vaccinio myrtilli-Pinetum*), dry boreal *Vaccinium vitis-idaea* pine forest (*Vaccinio vitis-idaeo-Pinetum*), dry boreal grassland (*Deschampsietum flexuosae*) and rare plant community of dry boreal *Vaccinium vitis-idaea* oak-pine forest (*Quercus robur-Pinus sylvestris*). The restoration project of the wooded meadow was recently started on the territory of the garden.

Ex situ plant conservation collections of TBG consist of 21 protected plant species of Estonia. Ex situ artificial habitats were established for *Woodsia ilvensis* (locally extinct), *Asplenium septentrionale* (I category protected species), *Oxytropis campestris* ssp. *campestris* (I category), *Jovibarba sobolifera* (II category), *Armeria maritima* ssp. *elongata* (III category). The propagation protocols were worked out for globally critically endangered fern species *Asplenium dielpallidum*, *Asplenium dielmannii* and *Asplenium diellaciniatum*, and first hundreds of plants propagated in TBG, were taken back to their natural habitat on Kauai, in collaboration with National Tropical Botanical Garden, Plant Extinction Prevention Program of Hawaiian Islands and State of Hawaii.

Botanical garden of Klaipėda university: location, landscape, and collections situation

ASTA KLIMIENĖ, RITA NEKROŠIENĖ, ELENA DAUBARIENĖ, LIUDA RAZMUVIENĖ, RITA GOLIAKOVIENĖ, MONIKA ČAPLIKAITĖ, LAURA NORMANTĖ

Kretingos str. 92, Klaipėda, Lithuania; E-mail: botanikos.sodas@ku.lt

The Botanical garden of Klaipėda University is situated in the North part of Klaipėda, in the valley of the river Danė on both sides of channel. In general the width of the territory is about 8.3 hectares of the land on the right bank and close to municipality bicycle path. This relief of the river's Dane valley has very various and beautiful landscape. At the grounds of the terrace here are survived the old riverbeds of the river. There are the usual oaks, the usual ash trees, the hornbeams, the small leaves limes trees. Some oaks are 200 and more years old. This territory also are rich by historical heritage. There is related with German, Prussian and Samogitia history. The Prussian king Frederic Wilhelm III and the Queen Luiz there visit too. In Botanic garden territory is old Germania (Prussian) cemetery.

The main aim of Klaipėda University botanical garden is to collect plants collection, investigate their acclimatization and carry out education activities. From the establish of the Botanical garden (1993) here are collected decorative and other valuable plants. They are exhibited in the three main oldest collections: Dendrology, Herbs and species plants and Floriculture. The most taxonomic number has Dendrology collection. Here are cultivate over 1500 taxonomic trees and scrubs.

The second important collection is Floriculture: over than 1100 of annual and perennial flowers. The more interesting and abundant are bulbous group flowers, *Hosta*, *Astilbe*, *Hemerocalis* and *Dahlias* genus.

In the collection of the Herbs and species are planted nearly 470 taxa of the plants. There are a lot of useful rare and protected plants in Lithuania and in world too. There *Luminaceae* family is biggest over than 100 species plants. There also is create Smell and Tea gardens.

In BG are creating new expositions: the climbing plants, seaside (dune), rose, Curland flowering and culinary plant garden.

The mild Baltic seaside climate is more appropriate for grow plants from different geographical zone and for acclimatization in country.

A new educational project in the DBW Botanic garden

GÖRAN ALLARD

Ekeby, Höstgårde 214, S-621 70 Visby, Sweden, allard.gotland@gmail.com

The board of the DBW Botanic garden has for a long time given the development of work with children and young people in high priority. Aside from the popular activities "barkboats in the stream" and "bats in the garden" we have not succeeded in developing new activities that will attract children and young people. For schoolchildren there has not been much of interest to offer during schooldays. So far we had not been successful in spite of cooperation with an educational organization.

We suggested though, a year ago, that we should start to cooperate with the small Gotlandic company "Äventyrspedagogerna" (Adventure educators) Teaching outdoors is a form of teaching which grows fast in Sweden. According to an article in the Forestry Association magazine "Skogen" (the Forest) "out isin" (=trendy.)

Outdoor learning is a way of working that offers concrete tools to strengthen groups and fight bullying. The activities build on joy, eagerness and imagination and the overall objectives are BELONGING, TRUST and to develop INTERACTION and TEAMWORKING through EXPERIENCES and GROUP DYNAMICS. This is now even more important with the growing number of immigrant children in our schools.

Cooperation is the basis of the program that has been developed for our botanic garden.

Here the garden is the playground for e.g. "Heroes of the Sea" where different actions have to take place and tasks solved by the small working groups with the help of maths, languages, environment, history and botany.

According to "Skogen" academic research made by Emilia Fägerstam at the University of Linköping has proved a number of positive effects of outdoor education:

- a more positive attitude to learning, thus learning more.
- increased sense of togetherness and interaction in classes.
- increased self confidence in language learning.
- easier for pupils to expand their vocabulary - to describe how the wind blows and how leaves move.
- pupils improved their results in maths.

We have just now in September 2016 completed the education of the first three school classes of 12 year old pupils and it was very successful.

We mean that "Adventure Learning" gives even more than ordinary outdoor learning thanks to the story and the excitement it gives the pupils on their way to solve the problems and find - in this case - the treasure.

A short presentation of Lund Botanical Garden, Sweden

JACOB OHLIN

Lund University, Östra Vallgatan 20, SE-22361 Lund, Sweden
botan@botan.lu.se

The Botanical Garden of Lund was founded as a part of Lund University in 1690 and got its present location and architecture in the 1860s under the leadership of the famous algologist Jacob Georg Agardh. Today the garden operates as a department within Lund University whose mission is to provide support for research and education as well as to impart knowledge about botany, horticulture and the environment to the general public. The gardens mission also includes ex-situ conservation of plants. It has an area of 8 ha and houses approximately 7000 species.

We are actively working to present an educational material that displays the variation and width in morphology and systematics, adaptations and life forms in plants native to Sweden as well as representatives from other geographic regions. Many of the trees are planted in demarcated sections of the garden according to family or genus showing common locally occurring trees alongside related species of interest from other regions. Worth mentioning from the Magnoliaceae section are two very large *Liriodendron tulipifera* from the beginning of the 19th century whose stylized flower is the symbol of the garden. The greenhouses are divided thematically into nine rooms with various climates, and houses among other things, two specimens of approximately 150-year-old *Cycas zeylanica*. All pestcontrol used in the garden is non-toxic and done by biological means in the greenhouses as well as in the garden itself. Lund Botanical Garden is located in the city center and has more than 500 000 visitors each year.

Novel microbiological ideas for horticulture

ADRIAN AUGUSTYNIAK¹, KRZYSZTOF CENDROWSKI², BARTŁOMIEJ GRYGORCEWICZ¹, MARTYNA BARYLAK², EWA MIJOWSKA², PAWEŁ NAWROTEK¹

¹West Pomeranian University of Technology, Szczecin, Department of Immunology, Microbiology and Physiological Chemistry, al. Piastów 45, 70-311 Szczecin, Poland,

²West Pomeranian University of Technology, Szczecin, Institute of Chemical and Environment Engineering, al. Piastów 45, 70-311 Szczecin, Poland,
e-mail: Adrian.inpersona@gmail.com

Horticulture is struggling with various problems from difficult environmental conditions such as droughts to contaminations caused by microorganisms pathogenic to plants. Among the examples of phytopathogens one may highlight *Pseudomonas syringae*, *Pectobacterium carotovorum*, or *Erwinia amylovora*. These bacteria may be transferred via contaminated water or through soil. There is a necessity to develop novel methods for eradication of phytopatogens that would lower the costs generated by fighting with scourges. Team working at the West Pomeranian University of Technology, Szczecin at the Centre for Nanotechnology Research and Education, developed several ideas that might find their application in horticulture.

First idea is based on bacteria from genus *Streptomyces*. These microorganisms play an important role in the natural environment in the mineralization processes. They also produce numerous secondary metabolites that may be used for biotechnological purposes (antibiotics, enzymes, pigments). One of their characteristics is an ability to gather water in the close environment, which could be useful during periods of drought. Recent studies showed that a strain of *Streptomyces* altered metabolic activity in response to titania/silica nanomaterials. In presence of nanostructures, secretion of humic acid increased rapidly. If similar reaction will occur in soil, this may show the potential application of nanomaterials in the microbiological enrichment of soil parameters.

Nanostructures may be also used to reduce number of undesired bacteria. Experiments showed that titania/silica nanotubes had caused a rapid agglomeration of *Pseudomonas aeruginosa* PAO1 in comparison to the control sample. Such state could probably prevent bacteria from adhesion to a surface. This hypothesis was confirmed in experiments on biofilm. Four nanomaterials (carbon nanotubes with or without Cu²⁺ ions, titania/silica nanotubes, and titania/silica nanospheres) successfully prevented *Pseudomonas syringae* and *Pectobacterium carotovorum* from forming biofilm on the polystyrene surface.

Another concept is to use natural resources in the combat against pathogens. Bacteria have their parasites which are called bacteriophages. These viruses can adsorb to specific cell, inject their nucleic acid, reproduce inside the bacterial cell, and eventually destroy it. In our studies bacteriophages were successfully used for reduction of human pathogens *Salmonella enterica* and *Escherichia coli* O157:H7 respectively in swine slurry and raw milk. Similar solutions could be used against phytopathogens.

We assume that our ideas may find an application in novel plant protection products. In this area we are open for cooperation and invite all potential collaborators to contact us.

Dendrological Garden in Przelevice – the evolution of concept

KATARZYNA MISIAK

*Ogród Dendrologiczny Samorządowy Zakład Budżetowy w Przelewicach, 74-210 Przelevice
kasia.misiak@ogrodprzelevice.pl*

Przelevice’s arboretum was based on the park surrounding local palace and established in the beginning of 19th century. At that time, the owner was engaged in a good space planning and economic issues. He believed that park should be beautiful and give fair yield in lowers, fruits, herbs and seeds along with valuable hay for animals. Nevertheless, foreign species were being introduced quite frugally. More plants of foreign origin appeared in the second half of 19th century when composition and selection of species were adjusted to standards corresponding to ducal gardens.

In the years 1922-33, the new owner – Conrad von Borsig evaluated existing plantings in terms of the park’s transformation into an arboretum in the naturalistic style. The leading idea was to collect possibly large number of trees and shrubs capable of adapting in the climate of West Pomerania. Simultaneously, emphasis was put on the composition of garden corresponding to habitat conditions.

Photographs from the years 1935-1938 and Borsig’s report indicate that many perennial plants were planted in order to guarantee appropriate decorativeness of the arboretum.

The first post-war name – the Dendrological and Pomological Garden – suggests that resources of orchard plants might have been as rich as ornamental trees and shrubs. Nevertheless, the revaluation of the establishment since 1975 had been exclusively led in the direction of ornamental plants. Furthermore, less attention was given to maintain the integrity of composition, in spite of the fact that park has been protected under a conservation programme since 1976.

Until the end of the 90’s, the main impact was put on the rebirth of species richness which was frequently associated with conscious modification of the former spatial orientation. The turn of the centuries was a period when new plantings were directed to achieve higher specialisation. One of the examples was an attempt to create the national collection of *Viburnum* species. Current works are aimed at establishing the direction of Garden’s operation for future. Among the assumptions are the focus shift towards native species, rising the rank of herbaceous plants in the collection, preservation and restoration of the cultural value, and – In relation to the first phase of the park’s existence – the emphasis on useful plants that are suitable for rural areas.

The Compatibility and Challenges of Old Dendropark Conservation and New Dendrological Exposition Establishment in Kaunas Botanical Garden of Vytautas Magnus University

ASTA MALAKAUSKIENĖ, NERIJUS JURKONIS

Kaunas Botanical Garden of Vytautas Magnus University, Ž. E. Žiliberio 6, Kaunas, LT- 46324, Lithuania, asta.malakauskiene@vdu.lt, nerijus.jurkonis@vdu.lt

In the beginning of 2016 Kaunas Botanical Garden of Vytautas Magnus University managed and protected 1477 dendrological collection units (number of taxa in cultivation), 9 woody plant species from „The Red List of Lithuania“ and 105 species from the international „The IUCN Red List of Threatened Species“. For several decades the number of collection units was stable or increased slightly as the priority was considered the conservation of the old dendropark with limited financial investments. Since the 2013 the priorities of dendrological collection management changed: new expositions of *Hydrangea*, *Rhododendron*, *Potentilla fruticosa* cultivars, *Calluna*, *Erica* and *Magnolia* were established. The number of collection units started increasing faster (184 new taxons per 2014, 120 – per 2015). Great part of trees in the dendropark have already reached the limits of their natural maturity (their seedlings were planted in 1923-1930). The average number of cut mature trees in dendrological collections ranges about 10 units per year. Investments in new expositions contributed to the increasing number of visitors (total number of visitors was 48.6 thousand in 2010, 55.0 – in 2012, 52.3 – in 2013, 62.3 – in 2014 and 76.6 – in 2015) and the financial income in the past few years, which will enable to allocate more finances for the old dendropark protection and renewal.

Endangered species protection as element of nature education

JOANNA JASKULSKA, ALICJA KOLASIŃSKA, ROKSANA LUBKOWSKA, JOANNA MARKIEWICZ

Adam Mickiewicz University Botanical Garden, Dąbrowskiego 165, 60-594 Poznań, Poland,
e-mail jmark@amu.edu.pl

One of the most essential functions of botanical gardens is the protection of rare and endangered plants. The Adam Mickiewicz University Botanical Garden in Poznań fulfills this goal by collecting native, legally protected and endangered species occurring in nature in various habitats and by gathering them in the Rare and Endangered Plant Section as well as in the Ecological Section (altogether about 300).

Nowadays, great emphasis is being placed on the importance of education as one of the most effective means of environmental protection. Educational activities at the AMU Botanical Garden take various forms: exhibitions, educational paths, applications, public lectures for children, open air events, events popularizing science as well as so called "science classes" for organized groups. Out of the list of offered activities presented above, it is the last mentioned one that enjoys the greatest popularity. Within our educational offer addressed to students of all levels of education, we conduct classes by incorporating various strategies promoting active learning.

In case of older children and teenagers, the best method is an outdoor game. The participants of the game „Plant detective”, for example, play plant prospectors. In small groups, equipped with maps, the students walk through the Garden, searching for native, endangered plants of various ecosystems, solving problems and discovering on their own rare plants together with their habitats, like European feather grass *Stipa joannis* Čelak. and yellow pheasant's eye *Adonis vernalis* L. (xerothermic grasslands), European white water-lily *Nymphaea alba* L. and bogbean *Menyanthes trifoliata* L. (aquatic plant community), dwarf birch *Betula nana* L. and bog-rosemary *Andromeda polifolia* L. (peatland plant community), Siberian iris *Iris sibirica* L. and globeflower *Trollius europaeus* L. (meadow plant community), sea holly *Eryngium maritimum* L. (sand dune plant community), mountain arnica *Arnica montana* L. and alpine saxifrage *Saxifraga paniculata* Mill. (alpine plant community), February daphne *Daphne mezereum* L. and goat's beard *Aruncus sylvestris* Kostel. (forest community). The participants of the game get to know the reasons for the species to be endangered, they familiarize themselves with the ways of their protection and become aware of the role of botanical gardens in rescuing of the native flora. The aim of such so-called „green lessons” is not only to share knowledge, but also to raise awareness of the beauty of nature and to evoke responsibility for the natural environment. Having collections of protected plants at their disposal, botanical gardens have the opportunity to organize educational activities connected with endangered species, which fulfills Target 14 Global Strategy for Plant Conservation.

Genetic and physiological studies for improvement of *ex situ* conservation efficiency of Polish endemic plants.

ANNA RUCIŃSKA, JERZY PUCHALSKI, MACIEJ NIEMCZYK, MARIAN SANIEWSKI

Polish Academy of Sciences Botanical Garden Center for Biological Diversity Conservation in Powsin,
Prawdziwka 2, 02-973 Warsaw, Poland, e-mail: bqpas@obpan.pl

Among 170 endemic and subendemic vascular plants occurring in Poland 30 are confined to the area of our country. Many of them are declining due to biotic and abiotic pressures, which can lead to species extinction. The diversity of endemic species requires conservation efforts that are effective and resource-efficient for plant diversity conservation. *In situ* conservation strategies are sometimes impossible due to changing climate, invasive species and habitat degradation and should be supported by *ex situ* conservation actions.

One of the main aim of the PAS Botanical Garden activity is to monitor and conserve *ex situ* diversity of Polish endemic species with special emphasis paid on the recognition of conservation genetic concerns in practical management. The genetic diversity conservation is achieved by cultivation as living plant collections and seed-banking as cryoconservation. In national cryogenic Seed Bank of PAS BG ca 20% of endemic species confined to Poland has been preserved. However the development of manuals and protocol for *ex situ* conservation of particular species should be concerned on the effectiveness of long-term *ex situ* genetic diversity preservation. To prepare the conservation guidelines for the protection of genetic diversity of two endemic species *Cochlearia polonica* and *Erysimum pieninicum* main area of research was focused on the effectiveness of *ex situ* conservation genetic diversity in artificial populations (living plant collections and cryoconserved in seed bank) and seed biology of germination and dormancy.

In order to investigate the effectiveness of different type *ex situ* conservation, genetic variation and genetic differentiation was assessed with inter simple sequence repeat (ISSR) markers. The level of genetic variation in each *ex situ* conserved populations was lower than the variation found in *in situ* population. Living plant collections generally exhibited the loss of genetic diversity with one exception one of field-collected *E. pieninicum* population, established with many individuals. Cryogenic preserved populations represented the mean genetic variation similar to corresponding *in situ* population. Seeds of both analysed species showed orthodox behaviour (could be easily dried and frozen at ultra-low temperatures of liquid nitrogen) and do not exhibit seed dormancy. We suggest that seed cryopreservation activity should be undertaken for the long – term conservation of species' genetic variation of more endemic Polish flora species as an effective *ex situ* conservation strategy at genetic level.

Long-term seed cryopreservation of rare and endangered polish ponto-pannonian plant species

JERZY PUCHALSKI, ADAM KAPLER, MACIEJ NIEMCZYK, PIOTR WALEROWSKI, ANTONI KRZYŻEWSKI, KONRAD WOLIŃSKI, WIESŁAW PODYMA

Polish Academy of Sciences Botanical Garden – Center for Biological Diversity Conservation in Powsin, Prawdziwka 2, 02-973 Warsaw, Poland, e-mail: bgpas@obpan.eu

Ponto-Pannonian floristic elements occur as xerothermophilous relics at scattered localities in entire Poland. The richest regions with those steppe plants are: Lublin Upland, Małopolska Upland and Pomerania. Some interesting sites can be also found at Pieniny massif. There are numerous projects dedicated to in situ conservation of critically endangered and Community important Pannonian species, but only few programs focused on their ex situ protection. Key role in modern, ex situ conservation of those resources play "Ex situ protection of native, protected and threatened species in Eastern Poland" – FlorNaturOB project. During this program germplasm of 61 species from 161 natural localities were secured in liquid nitrogen at BG-CBDC Seed Bank. Among them there are many species typical for dry grassland and steppe-forests habitats, some of them vulnerable or even critically endangered in Poland, yet still not protected by law eg.: *Veronica praecox* All., *Arabis recta* Vill., *Allium rotundum* L., *Bupleurum tenuissimum* L. etc. At present in cryogenic seed bank in our botanical garden 569 seed samples collected from natural localities (representing 165 species of Polish vascular flora) are stored.