

# 3<sup>rd</sup> Mediterranean Plant Conservation Week

“Plant Conservation Strategies: from Science to Practice”

Chania, Crete, Greece, 27 September to 1 October 2021

## Book of Abstracts



### EDITORS

G. Bacchetta, B. de Montmollin, C. Fournaraki, P. Gotsiou, A. Kokkinaki



Chania, CIHEAM-MAICh, 2021

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## 3<sup>rd</sup> Mediterranean Plant Conservation Week

The 3<sup>rd</sup> Mediterranean Plant Conservation Week (3MPCW), entitled 'Plant Conservation Strategies: from Science to Practice' is a conference aimed at researchers and young scientists engaged in plant conservation in the Mediterranean type ecosystems. The main theme of the 3MPCW is training and experience sharing in the field of Mediterranean plant conservation. The objective is that participants learn about current techniques in different fields of plant conservation and create partnerships that will help them to carry out their own projects. The main Thematic Areas are: 1) Taxonomy, inventories, Conservation Status assessment; 2) Conservation planning and *ex situ* / *in situ* techniques; 3) Networking, learning and communication.

The 3MPCW is organized in a hybrid way with both physical and virtual (an interactive experience with real-time access) participation. The conference is attended by scientists and students from universities, research institutes, gene banks, botanical gardens and parks of Mediterranean countries.

### About Mediterranean Plant Conservation Weeks

The first event of the 'Mediterranean Plant Conservation Week' concept took place in October 2016 in Montenegro, with the main organiser being IUCN; it was attended by about 80 people from 18 countries. The second 'Mediterranean Week' took place in November 2018 in Malta with main organisers being IUCN and MAICh through the 'CARE-MEDIFLORA' project (funded by the MAVA Foundation) and the participation of about 130 people from 25 different countries. More information is given at the following link: [http://www.medplantsweek.uicnmed.org/public\\_html/medplantsweek/en/home/](http://www.medplantsweek.uicnmed.org/public_html/medplantsweek/en/home/).

The previous two events show the great interest in this topic, as these 'Mediterranean Weeks' are an opportunity to acquire and exchange knowledge, network at the Mediterranean level and develop a dialogue with various stakeholders on biodiversity conservation and in particular rare plants, many of which are endemic to the Mediterranean. This time, for the 3<sup>rd</sup> Mediterranean Week, Crete and MAICh were chosen as venue, as the Mediterranean Plant Conservation Unit (MPCU) of MAICh is very active in this area and pioneer in the operation of the GENMEDA network

**Website:** [http://www.medplantsweek.uicnmed.org/public\\_html/medplantsweek/en/3rd-mpcw/](http://www.medplantsweek.uicnmed.org/public_html/medplantsweek/en/3rd-mpcw/)

**Conference venue:** International Conference Centre of CIHEAM Mediterranean Agronomic Institute of Chania (MAICh), Crete, Greece (<http://confer.maich.gr>) & online (virtual participation).

### Organisers

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Critical Ecosystem Partnership Fund (CEPF)

IUCN/SSC Mediterranean Plant Specialist Group (MPSG)

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AIMJB – Asociación Ibero-Macaronésica de Jardines Botánicos

Decentralised Administration of Crete

PIM – Projects and International partnerships for the conservation of Mediterranean island areas

OPTIMA-The Organization for the Phyto-Taxonomic Investigation of the Mediterranean Area

RIBES – Italian network of seedbanks

SEBOT - Spanish Botanical Society

## PROGRAMME AT A GLANCE

Monday 27 September	Tuesday 28 September	Wednesday 29 September	Thursday 30 September	Friday 1 October	Saturday 2 October
<b>8.30 – 12.00</b>	<b>8.30-12.00</b>	<b>8.30-12.00</b>	<b>08.00 – 17.00</b>	<b>8.30-12.00</b>	<b>9.00-20.30</b>
Arrivals / Internal meetings of GENMEDA, CEPF, etc.	Session 1: Taxonomy, inventories, Red Lists Chair: Lorenzo Peruzzi	Session 2: Conservation planning and <i>ex situ</i> / <i>in situ</i> techniques Chair: Maria Panitsa	Field trip (to Imbros gorge)	SESSION 3: Networking, learning and communication Chair: Pierre Carret	Post Meeting Excursion
	<b>10.00 – 10.30</b> Coffee break	<b>10.00 – 10.30</b> Coffee break		<b>10.00 – 10.30</b> Coffee break	
<b>12.00 – 13.30</b> Lunch	<b>12.00 – 13.30</b> Group photo Lunch	<b>12.00 – 13.30</b> Lunch		<b>12.00 – 13.30</b> Lunch	
<b>13.30 – 16.00</b> On-site Registration	<b>13.30-16.00</b> Afternoon Workshops Session & Coffee break	<b>13.30-16.00</b> Afternoon Workshops Session & Coffee break		<b>13.30-16.00</b> Afternoon Workshops Session & Coffee break	
<b>16.00 – 16.30</b> OPENING CEREMONY	<b>16.00 – 16.15</b> Presentation of the website "Trees and shrubs natives of North Africa", by Jesús Charco	<b>16.00 – 16.15</b> Conservation status of the endemic vascular flora of Sicily, by Emilio Di Gristina		<b>16.00 – 17.30</b> Projects Market Place & Poster Session	
<b>16.30 – 17.00</b> "Cretan Flora at a glance" (Mediterranean Plant Conservation Unit of MAICh)	<b>16.15 – 17.30</b> Projects Market Place & Poster Session	<b>16.15 – 17.30</b> Projects Market Place & Poster Session			
<b>17.00 – 17.30</b> "Plant Conservation in Greece" (C. Thanos & K. Georghiou)					
<b>17.30 – 18.30</b> Round-table: "Status of the Phyto-taxonomic investigation in the Mediterranean Area", coordinated by F. Raimondo and W. Greuter	<b>17.30 – 19.30</b> Side event by CEPF: "A Bunch of Flowering Initiatives" (with reception cocktail)	<b>17.30 – 19.30</b> Side Event: <i>Zelkova abelicea</i> project – final project workshop		CLOSURE	
<b>18.30</b> Welcome cocktail			<b>20.00</b> Gala Dinner		

**Please note:** All times as in EEST (UCT+3)



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Tuesday 28 September 2021

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## SESSION 1

# Taxonomy - inventories - Red Lists

**Chair:** Prof. Lorenzo Peruzzi

The objectives of this first day are to share with the participants different methods for inventorying plants in the field, identifying and naming them adequately, referencing them in GIS, assessing their levels of threat and establishing priorities in terms of conservation. The afternoon session will allow participants to deepen their practical knowledge, test different tools and share experiences.

## ORAL PRESENTATIONS

### The importance of a collaborative and integrated approach to taxonomic problems for the future of systematic botany

Peruzzi Lorenzo

Pisa University, Pisa, Italy

The lecture will mainly address two main problems which today threaten the social and scientific recognition of systematics as a basic science crucial for all applications involving the use of organisms, including their conservation. These problems concern a) nomenclature and b) taxonomy. Nomenclature: as a consequence of increasing systematic knowledge, scientific names of plants often change. While since about 15 years family-level circumscriptions (almost) became stable, species are often recombined under different genera or synonymized with others. This is perceived by taxonomy-users, either in scientific community or in the society, as a relevant, often not understood, problem. Collaborative nomenclatural and taxonomic databases are increasingly becoming widespread and authoritative, so that this problem could be easily superseded by increasing the awareness and the accessibility to such databases. Taxonomy: in general and still today, it is much easier to describe a new species than to definitely prove that it is not worthy of recognition on systematic grounds. This is resulting in a worldwide taxonomic inflation, which is causing inconsistencies also in conservation biology. This problem could be superseded only by adopting extreme caution before describing new taxa and, above all, by adopting integrated approaches to taxonomy, taking advantage of karyological, molecular, ecological data to be complemented by (quantitative) morphology. Finally, another topic which is becoming more and more important, related to floristics, concerns the free availability of verified and reliable primary biodiversity data. Also in this case, pros and cons of global and more local databases are briefly discussed, as well as the crucial role played by collaborative approaches.

**Keywords:** online databases, floristics, nomenclature, systematics, integrative taxonomy

# Inventories: What are the field inventory techniques, how to assess and monitor the size of a plant population, what computer tools are available

Dimopoulos Panayotis

Laboratory of Botany, Department of Biology, Division of Plant Biology, University of Patras, Patras, Greece

Nowadays, data availability of plant locations and georeferenced information about their habitat attributes and condition is easily accessible and freely, available in most cases. This fact in addition to the over improving big-data analysis techniques, machine learning methods, guides plant science to an analytical and interpretation role, overcoming field practice and new data collection needed for concrete, core assessments and results to fulfil scientific needs and management targets; especially, when the threat of climate change is documented and intensive human activities and natural disasters, such as floods, wildfires and hurricanes are more frequent, impacting with unpredicted results the local flora. This presentation deals with the current needs and aspects of inventorying plant data and information, based on field surveys, fulfilling a variety of targets such as International obligations for conservation (e.g., monitoring of Annex II, Dir.92/43/EEC taxa in the EU), field assessments for determining IUCN threat categories, plant population determination for pharmaceutical and aromatic plants, crop wild relatives' populations range and condition identification, etc. Our case deals with the fact that the computer tools and IT supporting platforms are and should be used as a valuable supporting framework, which helps guiding field effort e.g., by modelling potential distribution areas and/or areas of extinction risk for flora species and additionally, properly allocate monetary and human resources. By this, inventorying protocols for different purposes are presented alongside with computer tools used for supporting field work, as well as modelling techniques for plant population estimation based on field data and mathematical algorithms.

**Keywords:** botanical exploration, field sampling, Mediterranean flora, plant conservation, plant distribution modelling

## References:

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# Drafting a prioritized checklist of Crop Wild Relatives and Wild Harvested Plants of Italy: problems and solutions

Barone Giulio<sup>1</sup>, Ciancaleoni Simona<sup>2</sup>, Donnini Domizia<sup>2</sup>, Gigante Daniela<sup>2</sup>, Raggi Lorenzo<sup>2</sup>,  
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National checklists of Crop Wild Relatives (CWR) and Wild Harvested Plants (WHP) are the basic tools for the development of *in situ* and *ex situ* conservation strategies of these important plant genetic resources. Here we present our experience in the development of the prioritized checklist of CWR and WHP of Italy. The starting point was the most up to date Italian checklists of native and alien flora, with their updates used as nomenclatural and distributive source of data. The checklist was organized following the same format used in a previous Prioritized Inventory of CWR and WHP of Italy, dating back to 7 years ago, to allow an easier comparison among data of the two editions. Sardinia and Sicily were kept separate from peninsular Italy in order to perform detailed analyses focused on the taxa of the major islands. Ancillary information added were: the origin, the endemic status, cultivation, economic importance, uses, gene pool or taxon group, and the Red List status. The status of WHP was attributed to all the taxa with one or more known direct uses, independently of the actual commercialization of their products. For prioritization we used a qualitative approach, using three priority categories defined by a combination of criteria. The main criteria used are: 1) the inclusion of wild relative taxa of crops listed in Annex I of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and/or by the Italian Institute of Statistics (ISTAT) for cultivated areas and yield in the last 5 years; 2) the threatened taxa occurring in national or global Red lists; 3) the endemism. The data from the checklist are currently available through the area dedicated to the dissemination of phyto-taxonomic research projects in the Mediterranean area of the OPTIMA website (<https://www.optima-bot.org/index.php/en/projects/8-category-en-gb/217-the-italian-cwr-whp-database>).

**Keywords:** CWR, WHP, Conservation, databasing, Red List, Endemism, Sardinia, Sicily



## Incorporating inventories in GIS and R environments for investigating plant species distribution patterns

Fois Mauro<sup>1</sup>, Cuenca-Lombraña Alba<sup>1</sup>, Abdelaal Mohamed<sup>2</sup>, Ben Haj Jilani Imtinen<sup>3</sup>, Cambria Salvatore<sup>4</sup>,  
Minissale Pietro<sup>4</sup>, Nikolic Toni<sup>5</sup>, Bacchetta Gianluigi<sup>1</sup>

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From the variety of information regarding inventories, the simple occurrence of a species in a determined location and year is, if well processed, one of the most valuable. Although limited resources make the exhaustive and constantly updated distribution knowledge of all species a utopian goal, a large quantity, for a relatively long period of time, of this type of information is usually available, especially for plants. However, limiting the focus on priority species and environments is the first step when collecting information on their distribution. Reasons in this sense may vary, but biodiversity conservation is often the ultimate goal. Using the island of Sardinia as a study case, but not only, the available information about locally extinct, endangered (e.g. *Gentiana lutea* L.), endemic (e.g. *Rosa arabica* Crép.) and exotic (especially invasive) plant species were georeferenced in GIS, with special focuses on wetlands, small islands and biodiversity 'micro' hotspots. After expert revisions, such basic yet important information can serve for several purposes, especially if statistically processed in R or other similar computational environments. First, poorly-known species were investigated through the application of species distribution models in order to identify potentially suitable areas where a species can be searched, confirmed or reintroduced. An exhaustive distribution knowledge, as much as possible, about endangered and endemic plants can allow to identify areas for conservation prioritization and find possible gaps in the existing network of protected areas. Correlating the presence/absence, demographic traits and local extinction events of species of conservation concern with environmental (e.g. elevation), anthropogenic (e.g. fires) and biological (e.g. invasive species presence) factors allowed to address several ecological and conservation questions. Moreover, part of these research outputs were put into practice through the implementation of restoration projects. The results obtained are the fruit of a relatively cost-effective yet long-standing and constant work that can, and will, be improved in Sardinia and replicated in other territories. Some collaborations were already established with other Sardinian experts covering different topics like, among others, avifauna, bryology, protected areas management and habitat restoration. Further experts from different countries and regions, like Egypt, Croatia, Tunisia and Sicily are already established collaborators that are replicating at least part of the Sardinian experience. The hope is to enlarge such collaborations for reciprocal and mutual benefits.

**Keywords:** Knowledge sharing, Plant ecology and conservation, Species data processing, Species distribution models

## How to mobilise expert capacities (and time) for implementing IUCN Red List assessments on Mediterranean Monocots?

Véla Errol<sup>1</sup>, Numa Catherine<sup>2</sup>

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The current Red List assessment of Mediterranean plants aims to assess all endemic and near-endemic monocotyledon taxa of the Mediterranean Basin Hotspot, in order to identify those that are threatened with extinction. We initiated such an RL assessment during a 2015-2017 funded project. From a preliminary list of 1566 Mediterranean endemic taxa, we published RL assessment for 364 species or subspecies at Mediterranean and then global level. This contains 49 Orchids and 97 *Allium* in the Mediterranean subset, but 174 and 190 including European, Mediterranean and Global levels. Several difficulties were encountered and confronted, including problems of nomenclature, taxonomy, chorology, biology, ecology and field data. The choice of a taxonomic reference was strongly debated. We avoided this unsolvable question by adopting a fluctuant taxonomy adapted both to our field knowledge and the conservation issues. In particular, for the genera *Ophrys* and *Allium* we dealt with uncertainties about delimitation of taxa and their consequences, we proposed solutions and examined the consequences for conservation strategies. Data heterogeneity or deficiency (lack of quantitative data, lack of historical data, lack of global knowledge and lack of biological data) frequently made it difficult to apply the IUCN Red List Categories and Criteria. Some specific questions arose about functional biology and the resilience capacities of Orchids (e.g. severe fragmentation, overgrazing, forest fires and climatic change). We now try to build a strategy for achieving some objectives in order to complete the Monocots RL before to start a Dicots one in the future. Objective 1: complete and publish the draft assessment Monocots already done on SIS (64 taxa); Objective 2: transfer and update the data from European assessments of Mediterranean countries (576 taxa) into the global level; Objective 3: complete all *Allium* and Orchids species; Objective 4: try to complete Poaceae? A checklist of all species/subspecies published, or ongoing assessment or empty drafts will be provided to the participants.

**Keywords:** Monocotyledon plants, Mediterranean region, Orchids, *Allium*, Poaceae, Red List

## Presentation of the website "Trees and shrubs natives of North Africa"

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The website "Trees and shrubs natives of North Africa" is presented. The collaboration between the IUCN Centre for Mediterranean Cooperation and an extensive network of more than 50 experts from different countries, for almost 5 years, has made possible to update existing information and lay the creation of this web page. It features all native species of trees, shrubs, and woody climbing plants in North Africa. Sometimes very small but woody plants are included, or herbaceous but large plants with a more or less lignified stem base. In total, about 880 species have been included, out of 290 genera and 76 families. Their number may always vary a little depending on taxonomic updates or new discoveries. Up-to-date taxonomy, identification keys for all species, extensive descriptions, photographs, and interactive distribution maps are provided here. The website is freely accessible and will allow scientists, technicians, teachers, students and, in general, all nature lovers, to explore the extraordinary forest and botanical biodiversity of this part of the planet with such high biological diversity. This website also aims to be a meeting point to exchange information, plan and develop projects, open collaborations with other related websites and, ultimately, be useful for all those interested in the greater flora of North Africa. Undoubtedly the most important to stop the loss of biodiversity and fight against erosion and desertification. Above all its main objective is to revalue the native species. It is already well known that one of the main threats to ecosystems worldwide is the expansion by natural habitats of invasive species. Every day it is more fashionable to plant trees but the most important thing is to conserve and allow the recovery of natural vegetation. If trees and shrubs are planted, they should be only native.

**Keywords:** Trees and shrubs natives of North Africa, Website, Network, Biodiversity and fight against erosion and desertification

## AFTERNOON WORKSHOPS

### Workshop 1.1 How to assess taxa for the IUCN Red List

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The IUCN Red List of Threatened Species™ is essentially a checklist of taxa that have undergone an extinction risk assessment using the IUCN Red List Categories and Criteria. Although the majority of assessments appearing on The IUCN Red List are carried out by members of the IUCN Species Survival Commission (SSC), appointed Red List Authorities (RLAs), Red List Partners, or specialists working on IUCN-led assessment projects, the Red List assessments can really be carried out by anyone who has sufficient knowledge of a species and submitted to IUCN for consideration. The Red List process, the assessment scope, how to prepare a Red List assessment and the tools available to support drafting assessments will be explained and discussed with the participants.

**Keywords:** Extinction risk, IUCN SSC Mediterranean Plant Specialist Group, Species conservation status

## Workshop 1.2 Inventories, mapping and data sharing for supporting biological conservation and management planning: examples, difficulties and prospects of implementation

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Biodiversity inventories, especially if supported by precise mapping data, are fundamental tools for most of researchers, conservation managers and policy makers. However, several gaps in coverage and quality were identified in most of the world. Moreover, after their collection, all the information should be ideally archived and made available in online platforms, in order to ensure continuous revision, implementation, and for research, conservation and awareness. In the Mediterranean Basin, several yet poorly interconnected databases are present. Cases of obsolete and/or even inaccessible databases are unfortunately common. This is mainly due to the lack of constant availability of human and economic resources after their first release, leading to a loss of useful information. A solution, inspired by positive and long-standing examples, is to use the inventory data for planning biodiversity conservation projects. This would provide support for keeping up with inventories and researches. Accordingly, the second phase of the Mediterranean Island Wetlands-MedIsWet is a project for implementing restoration activities in several Mediterranean islands. This project is the continuum of desktop and field wetland inventories, freely available online. The Petites Îles de Méditerranée-PIM has also promoted, since its institution, the inventory of the numerous-once unexplored-small islands of the Mediterranean. This inventory has allowed to uncover their high vulnerability and to fund initiatives for their inventory and conservation status improvement, such as in the case of the National Park of Port-Cros in France or the next invasive species control and habitat restoration for the endangered plants of the islets of S. Macario in Sardinia and Gavdos in Crete. All the above reasoning leads to the following points of discussion to: (i) find standardized inventory approaches for facilitating data updating, interconnection and comparison; (ii) find more feasible and less costly solutions for implementing and managing data sharing platforms; (iii) formulate more inclusive data sharing agreements, acknowledging the crucial role of expert providers; (iv) create interactive networks of data providers to ensure exhaustive and relevant research and policy actions; (v) develop conservation projects based on inventory data.

**Keywords:** Database implementation and management, Knowledge sharing, Mediterranean islands inventories, Scientific-based projects

## SIDE EVENT

### CEPF: "A Bunch of Flowering Initiatives"– Exploring how civil society can strengthen botanical knowledge and conservation action

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This presentation will showcase successful plant conservation projects that bloomed during the CEPF' second investment phase in the Mediterranean, benefitting from earmarked funds for the conservation of Critically Endangered and Site Restricted Endemic plants. Enriched by this bunch of initiatives, the role and impact of civil society within the field of plant conservation will be dissected to better understand its reach, relevance, and potential.

**Keywords:** plant conservation, civil society, monitoring and evaluation, endangered species, red list, site restricted endemics

**References:**

Ecosystem Profile, Mediterranean Basin Biodiversity Hotspot. BirdLife International, 2017.

## POSTER SESSION

### 1. Never underestimate Sicilians: some case histories

Pasta Salvatore

IBBR-CNR, Palermo, Italy

We discuss some paradigmatic and paradoxical cases of plants first described from Sicily or originally occurring only on this island, which after being introduced worldwide proved to be able to live in different biomes and may become a threat for the biodiversity of the newly invaded habitats. The case of *Cistus × skanbergi* Lojac. demonstrates that the international seed trade network through websites may transform naturally odd and rare plants into cosmopolitan aliens. The recent introduction of *Limonium hyblaenum* Brullo in two different biomes (Mediterranean and temperate) over three continents shows that even narrow-ranged endemic plants may turn to be invasive when they are transferred thousands of miles away from their home range. Another case concerns *Genista etnensis* (Raf.) DC., probably introduced on Mt. Etna from Sardinia in historical times. Despite its extremely poor genetic variability, the Sicilian population was able to establish along a remarkably wide altitudinal range (from sea level up to 2000 m a.s.l.) on the slopes of Mt. Etna and recently revealed an invasive attitude in Campania (S. Italy), where it was introduced during last century, and worrying news about its widespread introduction and ongoing naturalization start to be recorded in many countries in Europe and beyond. Finally, we report the case of *Senecio squalidus* L., an emblematic example of the striking ability of newcomers to change their behavior and/or undergo significant niche shifts. Once strictly endemic to Mt. Etna, this ragwort was able not only to spread throughout the British Isles, but it played and still plays an unexpected role in the current evolution of the genus *Senecio* in UK.

## 2. Epiphytic lichens and bryophytes growing on *Zelkova abelicea* (Ulmaceae)

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The diversity and distribution of epiphytic lichens and bryophytes growing on the endemic Cretan tree *Zelkova abelicea* was investigated for the first time. We found that *Z. abelicea* hosts a high number of epiphytes. 60 lichen species and 10 moss species were recorded on dwarfed and normal-growing *Z. abelicea* individuals. Twelve lichen species had previously not been recorded for Crete, and three of them never for Greece. The mountains of western Crete had the highest diversity of lichens, while Mt. Kedros in central Crete had the highest diversity of bryophytes. Community composition was found to be different amongst sites and was influenced mainly by geographical position on the island, browsing intensity and tree type (dwarfed or normal-growing). Dwarfed, browsed *Z. abelicea* individuals were found to have as much epiphytic diversity as normal growing, non-browsed trees. Our results showed how little is known about the biodiversity occurring on phorophytes of Crete and highlights the need for further research.



### 3. Biosystematics and integrated taxonomy of the *Santolina chamaecyparissus* complex (Asteraceae): karyological and morphometric results

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The *Santolina chamaecyparissus* complex includes 14 species of dwarf aromatic shrubs endemic to the western portion of the Mediterranean Basin. The seemingly recent diversification of this complex makes it an interesting case study to better understand evolutionary patterns in one of the most important hotspots for biodiversity. An integrated approach involving morphometric, seed morpho-colorimetric, karyological, molecular, and niche similarity analyses is ongoing on this complex to elucidate its systematics and taxonomy. After karyological analyses, four ploidy levels have been detected: diploid, tetraploid, pentaploid, and hexaploid. Diploid species show a different karyotype structure with respect to tetraploids and hexaploids. *Santolina chamaecyparissus*, the only pentaploid species, shows an intermediate karyotype structure between diploids and other artioploids. Morphometric analyses suggest that, in general, there is a good phenotypic distinctiveness of species. However, some isolated populations in southern France show peculiar morphologies, so that their taxonomic position is unclear. In addition, tetraploid and hexaploid populations of *Santolina* from Corsica and Sardinia, traditionally referred to *S. corsica* and *S. insularis*, cannot be distinguished on morphological ground, and may represent a single species showing two cytotypes.

## 4. Use of TRIM statistical software to advice protection lists of endangered plants

Laguna Emilio<sup>1</sup>, Gómez-Serrano Miguel A.<sup>2</sup>, Fos Simón<sup>2</sup>

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This communication shows the experience developed in the Valencian Community (Spain) using TRIM (Trends and Indices for Monitoring data) statistical package to know the population trends of threatened plant species, and to advice the election of taxa to make and renew lists of protected species. TRIM V. 3.54 fits log-linear models that allows the analysis of time series with absence of data for some years. TRIM allows to calculate population indices that represent the effect of change between years. The program also considers aspects derived from the problem of over-dispersion and temporal autocorrelation in the number of individuals registered. In order to assess the renewal of the Valencian list of protected plant species, the population trends of 111 species have been analysed, 80 of them included in the Valencian Catalogue of Threatened Flora Species -which holds the most endangered taxa- and 31 in the lower Valencian category, named Non-Catalogued Protected Species. The results show minimal fluctuations during the first years for all the species analysed. Between 2002 and 2013, the general trend continued in stable or increasing values and, in 2014, there was a sudden and marked decline that coincides with an extraordinarily dry season, with a marked lack of rainfall and a prolonged persistence of the dry period, which covers most of the year. This strong decline marks the beginning of a fairly regular recovery-decline cycle that in 2019 appears to stabilize at lows. Statistical results yielded by TRIM allow to classify the species into 6 trends (2 positives: strong and moderate increase; 2 negatives: steep and moderate decline; stability, and uncertainty) which give a first orientation on the populations evolution throughout time. These results are complemented with additional expert criteria.

## 5. Plant diversity of olive groves under different management practices: the case study of Lesvos island

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The Mediterranean area is evolving through the interactions of nature and man. Agroecosystems often dominate and their management strongly affects biodiversity. Olive groves cover 19% of the area in Greece and of them only 8% are organic – with environment friendly farming practices - while the rest includes conventional or abandoned olive groves. Lesvos, the third-largest island of Greece, is characterized by rich plant diversity (more than 1560 plant taxa). 41% of the fertile land of the island is covered by olive groves. The current study aims to investigate plant species diversity of olive groves under different management practices. The sampling has been realized in 65 plots. Field surveys to sample the flora and vegetation at field scale were performed during April and May of 2020 and 2021. More than 280 plant taxa have been registered on the studied olive groves. The results showed that organic olive groves are characterized by a rich and diverse flora, mainly dominated by therophytes and especially of annual leguminous species and other insect-pollinated plants that are indicators of long-term but moderate human interference. Conventional olive groves have a poor and rather common flora also dominated by therophytes. Abandoned olive groves present a rather poor but diverse flora, mainly dominated by hemicryptophytes and phanerophytes and to a lower proportion of annual plants, depending also on when they have been abandoned.

## 6. Plant communities of the endemic *Quercus alnifolia* in Cyprus

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The Cyprus endemic species *Quercus alnifolia* grows at an altitudinal range of 600–1525 m, mainly as a shrub. It is one of the most ecologically important endemic species of Cyprus. This species forms communities that extend throughout the entire Troodos mountain range, and it appears either in pure stands, or in mixture with other taxa or even, as an understorey in pine stands. The priority habitat type of Annex I of the Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora "Scrub and low forest vegetation with *Quercus alnifolia* - 9390", is characterized by arborescent *Q. alnifolia*-dominated formations (pure stands). A plant micro-reserve that hosts a representative stand of this habitat type is found within the Natura 2000 site of "Koilada Kedron-Kampos". This habitat type occurs in the central Troodos range, where it has a relatively wide distribution. Among the main pressures affecting this habitat type are recreational activities, and disturbance of natural habitats. In the present project, a detailed inventory of the plant communities of *Q. alnifolia* has been realised in three different NATURA 2000 sites of Cyprus: "Ethniko Dasiko Parko Troodous", "Dasos Pafou", and "Dasos Machaira". Surveys to sample the plant composition and communities and vegetation at field scale were performed during May to September of 2020 and April to June of 2021. An average number of 25 different plant taxa have been registered on 36 sampling plots. The conservation status of the *Quercus alnifolia* communities and the pressures affecting them have been estimated and assessed.

## 7. First comprehensive IUCN red list assessment of plant species endemic to Lebanon

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From 2014 to 2020, 106 endemic plant species were assessed using the IUCN guidelines and criteria to evaluate conservation status. This constituted the first comprehensive red list assessment of the Lebanese flora. Most of the species assessed were in the Endangered category (54), followed by the Critically Endangered (21), Vulnerable (19), Least Concern (8), Nearly Threatened (3) and Data deficient (1). Different levels of endemism were defined to accurately identify the priority species to assess independently from administrative borders. The study proposed to consider endemism in terms of mountain ranges defining: endemic to the coast, to Mount Lebanon, Anti-Lebanon and Mount Hermon. Most of the species assessed were strictly endemic to Mount Lebanon (84). Due to the limited size of the country and its high density in human population, most of threats are widespread and affect equally the vegetation. Unregulated urbanization, road construction, quarries, forest fires and overgrazing constituted the main causes for the decrease of many endemic species by destroying their habitats. A geographic analysis allowed highlighting the regions and habitats in which the different categories occurred. Montane woodlands and slopes hosted most of the species assessed as CR and EN (34), followed by high plateaus (27), deep valleys (12) and coast (2). These areas should be targeted in priority for conservation actions such as the creation of protected areas.

## PROJECTS MARKET PLACE (POSTERS)

### M-1. Exploring habitat range and preferences of rare and insufficiently known local endemics

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This project focuses on increasing the knowledge on endemic plants in three Key Biodiversity Areas (KBAs) in Albania. A joint team of Oak Nature Conservation Association and Albanian Society for Protection of Birds & Mammals undertake field implementations in 2021 and cooperate with the regional administration of protected areas of Tirana, Gjirokastra, Vlora, as well as local communities and academic institutes. The study taxa are site restricted endemics, known in a small area, mostly only from the type collection. Therefore, there is no information on their population size, habitat specificity, and phenology; even the separation from similar taxa encounters difficulties. Our project aims to redound the efficient conservation of these plants by providing basic information on them. The involved endemic plant species are *Stachys albanica* Markgr. and *Carex markgrafii* Kük. in Biza-Martaneshi protected area, *Aubrieta albanica* F.K.Mey. & J.E.Mey., *Stachys sericophylla* Halácsy., and *Crocus novicii* V.Randjel. & Miljković in Nemerçka–Dhembël–Zagori partially protected area and *Sesleria albanica* Ujhelyi, *Hypericum haplophyloides* Halácsy & Bald, *Noccaea cikaea* F.K.Mey., *Limonium himariense* F.K.Mey, and *Reichardia albanica* F.Conti & D.Lakušic in Çika and Llogara partially protected area. According to the partial results, the species have very different characteristics and need different conservational approach. E.g. *Sesleria albanica* Ujhelyi is a dominant species of various habitats in Çika and Llogara site, while *Carex markgrafii* Kük. is extremely rare on mount Shën Noj. It is concluded that the main threats for these species include habitat degradation and destruction as a result of weak awareness of stakeholders and weak enforcement of authorities. For the protection of studied endemics, together with other taxa and unique habitats, the expansion of the partly protected KBAs is proposed. The project envisages a number of complementary actions to promote and enhance plant conservation, as awareness campaigns in local communities, education of young generation, workshops with stakeholders and production of a specific guide promoting the conservation of the plants.

Wednesday 29 September 2021

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SESSION 2  
Conservation planning and *ex situ* / *in situ*  
techniques

**Chair:** Prof. Maria Panitsa

*In situ* and *ex situ* conservation techniques are numerous. The aim of this second session is, on the one hand, to make an inventory of these techniques, on the other hand, to give examples of projects in which they have been successfully applied and, finally, to put the participants in contact with specialists who could help train them or work on concrete examples.

## ORAL PRESENTATIONS

### How to prepare a species conservation action plan - Action plans for plant conservation

Karavas Nicolaos

Natural Environment and Climate Change Agency, Athens, Greece

The updated Global Strategy for Plant Conservation (CBD 2012) set ambiguous targets for *in situ* and *ex situ* conservation, covering 75% of threatened plants. An important tool for reaching these targets is Action Plans. Action plans (AP) are compiled in order to assess the conservation status of species and their habitats, and to set conservation priorities. In EU the development of Species Action Plans (AP) for selected species listed in the Habitats Directive is supported by the European Commission. The targets of an AP for plant species are: 1) Achievement of a favorable population status; 2) Achievement of a favorable range status; 3) Maintenance of the favorable habitat status. An AP describes the specified species providing information about the status, ecology, pressures and threats and records the stakeholders at local, regional and national level. It evaluates the existing protection regime and previous conservation actions and ends up with a list of the key actions that are required to improve the conservation status of the species. These key actions show the way to restore the populations of the specific species and may refer to: Administration and enactments; Special conservation measures; Monitoring; Research and knowledge; Public awareness. Consultation takes place after the end of the plan and a follow up revision is conducted. In Mediterranean region good paradigms of AP have been compiled for species growing in Mediterranean islands.

**Keywords:** Action plan, *Silene holzmannii*, conservation measures



## *Ex situ* techniques: How to implement them, what are the skills in the Mediterranean

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*Ex situ* conservation means the conservation of components of biological diversity outside their natural habitats (Convention on Biological Diversity, 1992). The aim of *ex situ* conservation should be to reinforce or re-establish plant populations in the wild and serve as an emergency complementary reserve of plant genetic material. The importance of *ex situ* conservation is widely recognized, particularly in recent years due to human-caused habitat loss and degradation, climate change and invasive species. For this reason, seed storage methods have greatly improved in the last few decades. Seed banking, i.e., seed storage at -20°C, is the most popular technique for *ex situ* conservation as it offers long term storage, delivers high genetic variability and is relatively low cost and space efficient. However, conventional seed banking cannot be applied for all plant species and for these species a relatively new term has been developed; they are called exceptional species. Species that do not produce seeds or seeds are inadequately produced or non-viable, species with desiccation sensitive seeds, species with freeze-sensitive or short-lived seeds and species with deeply dormant seeds are identified as exceptional species and require different conservation approaches. Alternative conservation techniques include tissue culture, cryopreservation and living collections. Tissue culture provides short term storage for a limited number of genotypes but offers high number of plants and is suitable for symbiotic culture. Cryopreservation offers long term storage of plant parts in liquid nitrogen although the development of new protocols is high cost and high technical skills are required. Finally living collections also represent an important *ex situ* technique, although of limited genetic variation. Based on current experience, the majority of Mediterranean plants do not fall within the category exceptional species, but the knowledge of all available techniques is crucial for the *ex situ* conservation of the native Mediterranean flora.

**Keywords:** *ex situ* conservation, seed banking, cryopreservation, tissue culture, living collections, Mediterranean flora

## The RIBES strategy for *ex situ* conservation: conventional and modern techniques to inform seed storage

Magrini Sara, Bacchetta Gianluigi, Bedini Gianni, Bonomi Costantino, Carasso Valentina, Casavecchia Simona, Ceriani Roberta., Cristaudo Antonia, Di Cecco Valter, Di Martino Luciano, Fabrini Giuseppe, Guglielmo Francesco, Mariotti Mauro, Negri Valeria, Porceddu Marco, Salmeri Cristina, Villani Mariacristina., Zappa Elena  
RIBES – Rete Italiana Banche del Germoplasma per la conservazione *ex situ* della flora spontanea, NETWORK, Italy

The Italian seed bank network (RIBES) aims to improve the quality and safety of the germplasm reserves of native plant species in Italy to ensure the long-term conservation of endangered and/or endemic flora. The strategy includes traditional methods to secure seed conservation. Priority lists for the collection of both endemics and Crop Wild Relatives have been already drawn up and continuously updated according to the last published red lists. A safety-backup programme of duplicates will soon be implemented to secure the conservation of the most threatened species in at least two seedbanks of the network. Finally, RIBES participates as co-funder in the LIFE Nature project SEEDFORCE, coordinating 11 seedbanks of the network for collecting seeds/spores of 28 threatened species of EU interest. On the other hand, the RIBES strategy also includes research by applying modern techniques. In particular, a study of the behaviour of seeds and spores during freezing/heating cycles through thermal analysis is ongoing together with the Millennium Seed Bank to inform conservation. Using the Differential Scanning Calorimetry (DSC), a powerful technique commonly used in Material Science, we could evaluate seed properties such as glass transition temperature, melting, crystallisation, oxidation behaviour, and thermal stability. The first DSC analyses of terrestrial orchid seeds showed useful results indicating different optimal storage temperature ranges for different genera. Last but not least, RIBES collaborates with the Italian Scientific Commission for Antarctica for “Seeds for Future”, with the endorsement of the IUCN Species Survival Commission and the IUCN/SSC Seed Conservation Specialist Group. The project aims to create a Global Wild Plant Seed Vault in Antarctica, the most reliable and natural freezer globally, to secure the safe storage of seeds of the most threatened plant species, for the longest possible periods, possibly up to several centuries.

**Keywords:** conservation strategy, *ex situ* conservation, Italian flora, priority lists, seed-banks, seed/spore research

# Importance of evolutionary and ecosystem-based approaches to *in situ* conservation practices of the Mediterranean flora

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This contribution discusses some important issues related to *in situ* conservation practices of the Mediterranean flora. From an evolutionary perspective, phylogeography has proven to be a relevant tool for distinguishing evolutionary units within species resulting from contrasted biogeographical events. Yet, despite its usefulness, it is curiously underutilized in plant conservation genetics. Because current genetic variation can play a major role in providing resilience and local adaptation to future change, it is important to examine whether this genetic metric is properly taken into account in conservation planning for Mediterranean plants. Previous studies have shown that despite their narrow geographical ranges, Mediterranean endemic plants can be characterized by several lineages and their ESUs (Evolutionary Conservation Units) can be faced with different threats. Therefore, the identification of plant micro-reserves should also consider the conservation units of target species. The ecology and conservation biology of the mid-20th century was based on concepts that are now considered a bit naïve: (i) Ecosystems were considered to be in equilibrium, while their functioning is today considered to be partly and naturally chaotic; (ii) After a disturbance, ecosystems returned to a stage of equilibrium, the climax, via an ecological succession; (iii) Disturbances were thought to decrease species richness, while in most cases they increase (cf. Intermediate Disturbance Hypothesis (IDH)); (iv) Biodiversity was reduced to species diversity, while the number of species is only one descriptor of biodiversity; (vi) The species- by-species approach was the rule. Today, the ecosystem-based approach must be developed, by integrating ecosystem dynamics and species interactions. On the whole, it is important to keep management interventions at a minimum, in particular ecological restoration practices after highly publicized disturbances such as large Mediterranean fires. This is based on the fact that a protected area is neither a botanical garden nor a zoo, that its role is not to favour certain species at the expense of others, that nature often does things better than humans and that doing nothing sometimes constitutes the best management action. Obviously, keeping management interventions at a minimum does not mean a dogmatic rejection. The overall 'non-interventionism' approach in the management of some protected areas ultimately allows much more effective and less expensive ecosystem conservation than naïve ad hoc operations.

**Keywords:** Conservation genetics, Conservation Units, Ecosystem-based approaches, Endemic plants, Protected areas, Species interactions

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## Criteria for area prioritization, basic data collection and monitoring - case study from the eastern Adriatic coast

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The eastern coast of the Adriatic Sea is one of the most indented coasts in the world with more than 1000 islets and islands at a short spatial distance (78.4% of the total length of the Adriatic coastline). Various biogeographic, ecological and historical factors are the cause of large and globally recognized biodiversity. At the same time, the area is exposed to increasing anthropogenic pressure, especially the rapid and often spontaneous development of tourism and diverse supporting infrastructure. In this light, efforts to protect species and areas are becoming increasingly significant. The botanical community has made special efforts in recent decades to (1) accumulate data necessary in conservation programs, especially data on species distribution, (2) adopt existing or define new criteria for prioritizing protection, (3) apply criteria at the taxonomic and spatial level, and (4) integration of results into national and international conservation programs and initiatives. The basis for monitoring diversity and its spatial distribution is based on the decades-long accumulation of a range of different data as part of the work and development of the Flora Croatica database. This data platform was used to (1) assess the risk of species extinction, and (2) valorize the area for the purpose of identifying botanically important areas. Both of these groups of results have been integrated into national protection programs (national legislation, NATURA 2000), as well as into modifications of local spatial plans with the aim of sustainable spatial management. Monitoring of target habitats of species is in the initial stages.

**Keywords:** Adriatic Sea, plant diversity, important plant area, conservation

## *Lysimachia minoricensis* J. J. Rodr. on the way from EW to CR?

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*Lysimachia minoricensis* is an endemic of Menorca that since the middle of the last century is classified as extinct in the wild (EW). The causes of its extinction are unclear. It is not known for sure what the original habitat of the species was. The information provided by J. J. Rodríguez Femenias (1887, 1904), discoverer and author of the taxon, is inaccurate. Fortunately, the species was preserved in the Barcelona Botanical Garden (Bolòs, 1954). Shortly after the knowledge of its extinction, the first initiatives for reintroduction were activated. Many attempts have been made to date. All of them have failed or have had a limited duration. The plants grew well in the early years, whether they were sown from seed or introduced in the form of adult plants. There was a high seed production also, but the number of spontaneous germinations was zero or very low. Then, when the adult plants died, the population disappeared. Attempts of reintroduction were made in different localities and habitats, but they all followed the same path. Four years ago, a new attempt was made in a different habitat from the previous ones: a cliff foot where there were soils with a high content of organic matter, which had had a moderate alteration (cleaning of nitrophilous vegetation) and which maintained a moderate humidity level due to the existence of a small water source. The species was introduced by planting adult plants and seed was also planted. The behaviour it has had in this new locality is completely different from the previous ones. Here the population is dynamic, with constant germinations and the plants are vigorous with a more perennial behaviour. Everything seems to indicate that this is the ideal habitat for the species and that there could already be a permanent population here.

**Keywords:** Menorca, narrow endemics, conservation, extinction, reintroduction, habitat knowledge

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# Conservation status of the endemic vascular flora of Sicily

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Among the large islands of the Mediterranean, Sicily is the one with the richest and most diversified plant heritage. Over 3250 specific and infraspecific taxa of native, naturalized or traditionally grown exotic plants are attributed to this island. According to the last one, - conducted with the contribution of various specialists in all Italian regions and published in 2018 - the native flora of Sicily is made up of 2763 specific and subspecific taxa. The endemic contingent accounts for just over 15%. Our updated account of the vascular flora of Sicily includes 431 endemics. The number of endemics at risk of extinction has increased year by year; other taxa, attributed to lower risk categories, even if they fall within protected areas do not enjoy any particular protection, others have seen reduced or altered their elective habitat, suffering a strong demographic contraction in populations. There are several contributions, including expert-based evaluations, on the endangered flora of Sicily. Among these contributions, the assessments made within the Italian Botanical Society on behalf of the Ministry of the Environment of the national government, follow the scientific criteria proposed by the IUCN. In this contribution we compare the quantitative data of the IUCN conservation categories reported in the different contributions for the endemic taxa of the vascular flora of Sicily. This was done integrating the data taken from the previous published sources that, in some cases, have different taxonomic delimitations. The results showed that only a part of the endemic taxa of the Sicilian flora was evaluated according to the IUCN criteria. Therefore, there is a need to further invest in research aimed at highlighting the real status of conservation of the contingent of regional endemic species following standardized criteria.

**Keywords:** Assessment, censuses, endemism, islands flora, IUCN criteria, Mediterranean native flora, red lists

## AFTERNOON WORKSHOPS

### Workshop 2.1 From plant hunting to plant conservation

Moreno Saiz Juan Carlos<sup>1</sup>, Laguna Emilio<sup>2</sup>, Peruzzi Lorenzo<sup>3</sup>, Thanos Costas A.<sup>4</sup>, Véla Errol<sup>5</sup>

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A short introduction and discussion on how information from plant taxonomists or even amateur botanists is utilized in plant conservation, what problems arise from taxonomy itself, but also from the lack of data on plant species biology; also, the issue of massive information, even by amateur botanists, and what consequences this can have on plant conservation.

## Workshop 2.2 Novel initiatives for Plant conservation in the Mediterranean

Bonomi Costantino

Workshop coordinator; Head of Botany at Trento Science Museum, Trento, Italy

Developing successful plant conservation projects is a challenging task and requires an inclusive and multi-disciplinary approach, putting together diverse expertise to address all critical issues for a successful outcome. An integrated in-situ and ex-situ approach can yield numerous benefits and offer opportunities to showcase to the public the actual plants conservationists aim to protect to build participation and support from the local community. As a case study the recently approved Life+ SEEDFORCE project will be illustrated. In this project included best practice preparatory actions to assess the genetic make-up of the target species and populations, analyse the current species climatic envelope and project possible future scenarios, taking into account trophic dependencies in target species. The outcome of such preparatory actions will be used to prepare the propagation mix best adapted for each site to be used for reintroduction and population reinforcement. Once identified threats will be removed, the target populations will be reinforced or re-established in extinct sites. A series of engagement activities have been devised to gain public support and to involve farmers that in most cases can influence the long-term conservation of many plant species in secondary habitats. The workshop aims at sharing experiences, best practice and lesson learnt of successful plant conservation projects, providing a forum to discuss and develop new project ideas in an international perspective.



## SIDE EVENT

### *Zelkova abelicea* project – final project workshop: Guidelines and Recommendations for the Long-term Conservation of *Z. abelicea* in Crete

Ghosn Dany, Remoundou Ilektra

Geo-information in Environmental Management, CIHEAM-MAICh, Chania, Greece

Within the framework of the International Zelkova project ([www.zelkova.ch](http://www.zelkova.ch)), in partnership with the University of Fribourg – Switzerland and with funds from the Fondation Franklinia (<https://fondationfranklinia.org/>); the CIHEAM-MAICh in collaboration with the four Forest Directorates of Crete (Chania, Rethymno Herakion and Lassithi) and the University of Fribourg initiated in 2014 a project entitled: ‘Conservation of *Z. abelicea* in Crete’ (<https://abelitsia.gr/en/>). The overall objective of the project was to enable, enhance and promote the long-term conservation of the endangered Cretan tree *Z. abelicea* by coupling *in situ* and *ex situ* conservation actions with communication and outreach activities, while at the same time gathering valuable scientific information about the ecology, the biology and the risk level of the species. The project represents the first attempt to develop a common approach and methodology for the conservation of *Z. abelicea* in Crete, where a high level of endemism is associated with a remarkable degree of environmental and human influences. The guidelines and recommendations are based on the results of 8 years of monitoring and various scientific studies aiming at improving the knowledge for the most effective protection of *Z. abelicea* in Crete. Those guidelines and recommendations can be used as support for the long-term conservation of the species and are addressed to National Authorities, decision makers, nature conservationists or anyone else interested in the conservation of *Z. abelicea*.

**Keywords:** conservation actions, *Zelkova abelicea*, endemic species, Cretan mountains, overgrazing, consultation, decision-makers

## POSTER SESSION

### 8. How much do we know about genetic diversity of threatened plants?

Ducrettet Juliette, Imbert Eric

ISEM-Université de Montpellier, CNRS, IRD, EPHE-Montpellier, France

Extinction is a demographic process caused both by ecological and genetic factors. On the long-term, population persistence relies on their evolutionary potential, which could be estimated with genetic diversity. As threatened species have often small and isolated population, we expect genetic diversity of these species to be lower than that of non threatened congeners. In a first part of the presentation, we will present a synthesis of population genetic studies to assess genetic diversity of threatened plants in France and show that threatened species have a lower genetic diversity than their non threatened congeners, as expected. This result brings an argument to the integration of genetic diversity in management plans. Then using management plans and survey addressed to practitioners, we analysed the reference to genetics and associated parameters in management actions in France. Most management plans refer to «genetic diversity» but «genetic data collection» is rarely implemented. Thus perception of genetics by practitioner is not translated in the use of genetics. While knowledge on habitats and ecological characteristics are fully integrated in management action, information on life-history traits known to influence genetic diversity is not very common while they are important in decision-making for management. We discussed the barriers to use genetic data and to integrate evolutionary potential in managements. Finally, we will present our work to produce jointly with practioners guidelines for integrating evolutionary potential in managements.

## 9. A project for the conservation of the narrow endemic *Ptilostemon greuteri*, a woody Asteraceae from NW Sicily (Italy)

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Kozłowski Gregor<sup>5</sup>, Garfi Giuseppe<sup>1</sup>

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*Ptilostemon greuteri* Raimondo & Domina is a shrub known only from two small subpopulations in north-western Sicily. The whole population is composed of a few thousand individuals of which only a few dozen are estimated to be reproductive. This species grows on calcareous cliffs, cliff-bases, ledges and screes on the northern slopes of Monte Inici. Severe and repeated arsons have affected both subpopulations in recent years, and wildfires currently represent the main threat for the conservation of the species. Although new seedlings rapidly appear due to massive post-fire germination, adult plants are unable to re-sprout after burning and none have survived after the most recent wildfire of 2017 that affected one of the subpopulations. The species is listed as Critically Endangered (CR) according to IUCN criteria, and all subpopulations are located within the Special Area of Conservation ITA010015 "Complesso Monti di Castellammare del Golfo". However, the species has no legal protection and is not included in any (inter)national conservation scheme. A two-year project for the conservation of *P. greuteri* was initiated in July 2021. The goal is to improve the conservation status of the species and ensure its long-term conservation by increasing the number of subpopulations and avoiding the destruction of the few reproductive plants. The poorly studied ecological requirements, reproductive biology and dispersal strategy of *P. greuteri* will be investigated preliminarily to gain knowledge for a more precise implementation of conservation actions. In-depth analyses of the floristic composition of the plant community and demographic structure of the subpopulations, coupled to the collection of microclimatic data will be undertaken to perform niche modelling in order to help find sites with the most suitable growth conditions for any future translocation programs. Concrete actions include collecting seeds for in-situ and ex-situ conservation purposes, fencing, translocation in new suitable sites and monitoring of performance indicators of the project implementation.

## 10. Integrated conservation measures of *Calendula maritima* Guss., a rare and threatened species from the western coast of Sicily

Gristina Alessandro Silvestre<sup>1</sup>, Abbate Loredana<sup>1</sup>, Carimi Francesco<sup>1</sup>, Carra Angela<sup>1</sup>, De Michele Roberto<sup>1</sup>, Fontana Ignazio<sup>1</sup>, La Bella Francesca<sup>1</sup>, Livreri Console Salvatore<sup>2</sup>, Mercati Francesco<sup>1</sup>, Motisi Antonio<sup>1</sup>, Pasta Salvatore<sup>1</sup>, Zerbo Marcello<sup>1</sup>, Garfi Giuseppe<sup>1</sup>, Catalano Caterina<sup>3</sup>

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During the last century, Mediterranean coastal areas suffered from a rapid increase in human impact inducing severe habitat destruction/degradation and the disappearance of many plant species. *Calendula maritima* Guss. (Asteraceae) is a rare herbaceous plant endemic of western Sicily, adapted to live in several plant communities of the coastal ecosystems. In spite of its wide ecological niche, its distribution range underwent a striking shrinkage due to heavy anthropogenic pressure. As a result, it became extinct in different locations where its presence was historically documented. At present *C. maritima* consists of only 16 small and scattered populations distributed all along the coast between Trapani and Marsala (western Sicily) and in a few nearby islets. According to IUCN categories, *C. maritima* is ranked as Critically Endangered and listed among the Top 50 Mediterranean island plants at brink of extinction. Based on the above, we implemented an integrated conservation strategy aimed at improving the long-term conservation of *C. maritima* within the activities of the LIFE project CalMarSi (<https://lifecalmarsisi.eu/>). The most important concrete safeguard actions involved: i) the genetic characterization of all known populations to assess the genetic variability and exclude the risk of genetic pollution by the congeneric species *C. fulgida* Raf. in order to conserve the purest and most diverse lines; ii) in-vitro propagation of genetically selected lineages for *in situ* and *ex situ* conservation actions; iii) population reinforcement and reintroduction according to principles of species translocation. In addition, complementary actions have been carried out, such as: removal of invasive alien species, reduction of mechanical disturbances by means of physical barriers, promulgation of legal protection laws, improvement of the awareness about the naturalistic value and the vulnerability of both the habitat and the target species.

## 11. Regeneration niche in high mountain species of the genus *Aquilegia* (Ranunculaceae)

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Seed germination constitutes a critical event in the life cycle of spermatophytes and identifying the processes of seed germination and dormancy enables to understand plant adaptation and effectively contribute to plant conservation. So far, only a few studies on seed dormancy and germination behavior in *Aquilegia* have been conducted. Here, we investigated seed germination in 11 populations belonging to five high mountain species of *Aquilegia* distributed on subalpine grasslands of Northern Italy. The selected species are *Aquilegia alpina* L., *A. lucensis* E.Nardi, *A. reuteri* Boiss., *A. ophiolithica* Barberis & E.Nardi, and *A. bertolonii* Schott. Seeds were exposed to different temperatures shortly after harvesting, while others were pre-treated either with warm stratification, cold stratification, or with a sequence of warm + cold stratification. Moreover, a “move-along” experiment where the seeds were exposed to different seasonal temperature regimes was simultaneously conducted, complemented by periodic seed sections to monitor embryo growth over time. Seeds exposed to alternating temperatures show higher germination. Seed sections highlighted a slow but progressive embryo growth in all populations during the “move-along” experiment. Experiments are still continuing, by periodically moving the ungerminated seeds to different temperature conditions, to identify the best thermal sequence to break dormancy. Conducting these studies will help to better understand the adaptive mechanisms underpinning the regeneration niche. Moreover, the acquired knowledge would serve to implement tailored strategies for the conservation of these species and to make predictions about their responses to climate change.

## 12. *Ex situ* and *in situ* actions to recover species of the Catalogue of Threatened Plants in the Valencian Community (Spain)

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As a part of the main work of the Wildlife Service (Servicio de Vida Silvestre y Red Natura 2000) in the Valencian Community, developed through the Centre for Forestry Research and Experimentation (CIEF) and the Centre for Conservation of Freshwater Species (CCEDCV), a large list of threatened plant species has been object of plant production and further use in conservation translocations since the decade of 1990. This communication analyses the results obtained after 30 years of accumulated experience (1992-2021) working with species of the Valencian Catalogue of Threatened Plant Species. This Catalogue lists the most endangered Valencian protected species, classified in two categories; In Danger of Extinction (A), and Vulnerable (B) -although its name include species much more endangered than those of the IUCN's homonym category-. For the development of these actions, 1134 seed lots of taxa included in these two categories have been collected and conserved, 1001 belonging to 60 terrestrial species –27A and 33B– and 133 to 16 aquatic species –5A and 11B–. In order to develop conservation translocations, 104,606 specimens have been obtained in the CIEF and CCEDCV nurseries (63,891 of terrestrial and 40,715 of aquatic plants). Data from 25 species In Danger of Extinction (18 terrestrial and 7 aquatic species) and 32 species classified as Vulnerable (19 terrestrial and 13 aquatic ones), yield that 580 translocation actions have been performed (375 for terrestrial flora and 205 for aquatic plants). Most of them made to set up new populations at mid or long term, as well as reinforcements in a minor proportion. Currently 61 of the above indicated translocations (47 of terrestrial flora and 14 of aquatic flora) are classified as new stable populations and have become part of the Valencian monitoring program of endangered plant species.

### 13. Studies of salt and drought tolerance of endemic and rare species of Valencian salt marshes as a tool in reintroduction programs

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Plant growth under stress conditions depends on the effectiveness of the tolerance mechanisms of each species. The strategy of conducting comparative studies in genetically related taxa with different degrees of tolerance is a valuable approach, especially in distinguishing the tolerance-relevant responses. The study has been performed on two *Limonium*, one *Thalictrum* and two *Bupleurum* species. The data obtained indicated that salinity is not a limiting factor for the reintroduction of the two *Limonium* species of interest in l'Albufera Natural Park (Valencia, Spain), as the two species tolerate much higher salinity under controlled conditions than those of their natural habitats. However, water scarcity could be a problem for *L. albuferae*, while *L. dufourii* should not be introduced in areas prone to prolonged flooding. *Thalictrum maritimum* behaved as a moderate halophytic species, with optimal growth in the absence of salinity but tolerating concentrations much higher than those of its natural habitats. However, it was shown to be sensitive to water deficit. *Bupleurum tenuissimum*, a moderate halophyte, was shown to be more sensitive to water stress while *B. fruticosum* was more susceptible to salinity even at low concentrations. Analysis of the *Limonium* species suggested that their stress tolerance mechanisms are mainly based on ionic transport along with synthesis and accumulation of compatible solutes. The main mechanism of *Thalictrum maritimum* for salinity tolerance is related to the active transport of ions to the aerial part and the maintenance of K<sup>+</sup> vs. increased Na<sup>+</sup> in the leaves and the activation of enzymatic antioxidant systems. Unlike the other species, in *Bupleurum* the main mechanism of resistance to salt stress is the prevention of foliar accumulation of toxic ions. Data may help in the design and implementation of conservation, reinforcement or reintroduction programs, and for the management of threatened populations of these rare endemic species.

## 14. Recovery, characterization and conservation of some autochthonous Common bean (*Phaseolus vulgaris* L.) landraces of Molise (south-central Italy)

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Respect to commercial varieties, some autochthon landraces have shown a high resistance towards biotic and abiotic stresses due to their wide genetic variability, which make them more easily adaptable to different environmental conditions. In this framework, the present study aimed to determine seed germination potential and plant tolerance of seven autochthonous common bean (*Phaseolus vulgaris* L.) landraces, most of them collected from Molise region (named CV, MO, PI and SA) and some from Tuscany (named MA) and Basilicata (named TR and SMR) regions, subjected to salt (NaCl 200 mM) and osmotic stress (mannitol 180 mM). The stress tolerance was evaluated on seed germination – calculating final germination percentage (G%) and germination speed (T50) - and on plant growth - analysing the main morphological parameters together with physiological ones, like proline, malondialdehyde (MDA), total chlorophyll and carotenoids. At seed level, osmotic stress did not affect G% of all populations while we observed a reduction of G% and increase of T50 under salinity stress especially in CV, MO and TR populations. On the other hand, at plant level, CV, MO and TR showed the highest tolerance towards both stresses, while the remaining populations resulted affected by both salt and osmotic stress. In detail, we observed a decrease in term of biomass accumulation under salinity stress in root and stem of PI, in leaves of MA and in all organs of SMR and SA. Osmotic stress caused a decreasing in biomass accumulation only in SMR and MA (leaves) and SA (stem and leaves). The two stress typologies differently affect proline, MDA, chlorophyll and carotenoids content in the three organs of each population, leading us to hypothesize that their genetic heterogeneity could serve as an adaptive trait under stressful environments and could cause a distinct response at seed or organ/plant level.



15. The establishment of a fenced Plant Micro-Reserve (2006) has led to an apparent boost for the *in situ* conservation and population enhancement of *Cephalanthera cucullata*, an endangered, endemic orchid of Crete

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*Cephalanthera cucullata* Boiss. & Heldr. is an endemic orchid of Crete, growing in wooded, shaded locations on most mountain massifs of the island. It is a species of European priority (Annex II, 92/43/EEC Directive) and is characterized as endangered (EN) by both the Red Data Book of Rare and Threatened Plants of Greece (2009) and the latest evaluation of the orchids of Greece (Tsiftsis & Tsiripidis, 2016), while in the IUCN Red List of Threatened Species (2018) it is considered as vulnerable (VU). A population decline had been observed after 1980 due to overgrazing and habitat degradation. During the implementation of LIFE project CRETAPLANT (2004-2007), in order to conserve the largest subpopulation in western Crete, a Plant Micro-Reserve (PMR) (12.1 ha) was established (2006) near Koustogerako village (Lefka Ori, 1300 m asl, mean annual temperature c. 12.5 °C and precipitation >1000 mm). The PMR was fenced, thus offering protection from overgrazing and enabling the monitoring of population dynamics of the species throughout the period 2006-2021. Tagging and mapping each aboveground emerging individual (usually bearing several stems) has revealed an interannually erratic, vegetative/reproductive growth (due to vegetative dormancy) of *C. cucullata*, with a mean interval of individual emergence estimated at c. 2.5 yrs. A total of 482 individuals have been observed over this 15-yr-long period, with a maximum number of 189 recorded in 2021 and a minimum of 54 in 2006; we postulate that the overall number of individuals within the PMR has at least doubled during the monitoring period. In addition to the *in situ* management, an ex-situ conservation initiative has also been pursued to safeguard germplasm of the species in the Seed Banks of NKUA and MACh. Preliminary data on asymbiotic, lab germination and propagation of this orchid confirm the general belief that *Cephalanthera* seeds are extremely difficult to germinate.

## 16. Plant Micro-Reserves planning at the protected areas of Chelmos-Vouraikos Management Body (N Peloponnisos, Greece)

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The territorial jurisdiction of Chelmos-Vouraikos Management Body includes eight Special Areas of Conservation of the Natura 2000 Network. These areas are characterized by a high plant species diversity and a large number of Greek, regional and local endemics many of which belong to one of the IUCN Red List categories. This communication presents the methodology and first results of a project that is taking place in the area and supervised by Chelmos-Vouraikos Management Body that deals with the development of a Plant Micro-Reserves (PMR) Network, based on previous efforts, experience and outcomes of the pioneering Valencia PMR project (Spain) and the CRETAPLANT project (Crete, Greece). The proposed PMR network will include micro-reserves that will be located on public land, within Chelmos-Vouraikos National Park and other Natura 2000 sites supervised by Chelmos-Vouraikos Management Body. The under development micro-reserves will include the populations of local endemics, exclusively found on only one of the Natura 2000 sites, i.e. *Alchemilla aroanica*, *Lonicera alpigera* subsp. *hellenica*, *Polygala subuniflora*, *Silene conglomeratica*, *Valeriana crinii* subsp. *crinii*, and *Veronica contandriopouli*. The populations of these rare taxa coexist with other important for conservation endemic taxa among which *Globularia stygia*, a species included in Annexes II, IV & V of the Directive 92/43/EE. In the framework of this project a detailed inventorying of the localities for the target species and their habitats is taking place, concerning the characteristics of the populations, the plant communities and habitat types, their structure and functions and the current pressures and threats in order to designate and propose precise sites for the Plant Micro-Reserves (PMR) implementation. Subsequently, monitoring plans will be elaborated including baseline reference data for every PMR and the necessary conservation actions will be proposed.

## 17. Microsatellite (SSR) markers as a tool to manage the critically endangered taxon *Cistus heterophyllus* Desf. subsp. *carthaginensis* (Pau) M. B. Crespo & Mateo

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*Cistus heterophyllus* subsp. *carthaginensis* is considered a critically endangered (CR) taxon according to the IUCN categories. It is the only flowering plant of Spain in this situation, which is justified because there is only one natural population in Murcia and another with a unique original individual in Valencia. Besides the few natural populations, an added problem is the tendency of this species to hybridise with *Cistus albidus* L., a sister taxon. SSR markers are a powerful and easy-to-use tool for conducting population genetic studies: to detect intraspecific relationships, genetic diversity and, particularly, hybridisation, thanks to its codominant inheritance. A SSR library has been developed for *C. heterophyllus* in order to study the current situation of natural and introduced populations and to manage the risk of hybridisation that, in the worst scenario, could dilute the alleles of Cartagena rockrose in the genome of *C. albidus*. Low genetic diversity was found in the Valencian specimens, in accordance with their origin from a single individual, and high levels of hybridisation in the native plants from Murcia. In addition, the Valencian population is more related to northern African populations rather than those from Murcia. These preliminary results should set some guidelines to management plans, in which preventing the mixture of Spanish populations should be the first priority. Furthermore, the impoverished genetic status of Valencian plants and the high level of hybridisation of the Murcian ones should guide the next strategies in their respective management plans. Therefore, this molecular tool could facilitate their development, helping to select the most appropriate genotypes from the nursery seedlings.

## 18. Preliminary results of the long-term monitoring of the unique population of *Horstrissea dolinicola*: a steno-endemic, threatened plant of Crete, Greece

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*Horstrissea dolinicola* Greuter, P. Gerstberger & B. Egli (Apiaceae) is a dwarf perennial geophyte endemic of Crete and it is only found in a few limestone sinks (dolines) on Mt. Ida (Psiloritis) at about 1,500 m a.s.l. *H. dolinicola* has been categorized as CR (Critically Endangered) according to the IUCN Red List and it is also considered one of the Top 50 Mediterranean Island Plants by the IUCN/SSC Mediterranean Plant Specialist Group. Its unique population is confined to an area where livestock farming is promoted by policies that support livestock development in the region. Although the species is well adapted to withstand extreme grazing pressure, livestock installations present a threat to its survival. Recent *in situ* conservation actions implemented in the framework of the project CARE-MEDIFLORA (2016-2019) include the creation of a detailed distribution map of the population, population reinforcement, relocation of livestock installations and the establishment of a Plant Micro-Reserve for the species. Within the Plant Micro-Reserve, permanent monitoring plots were established in order to gather information related to population dynamics of *H. dolinicola* and its biotic interactions, namely predation and competition. Monitoring is implemented twice annually in the framework of an ongoing conservation project for *H. dolinicola* (2020-2022). In parallel, long-term monitoring of the recent population reinforcement actions is also implemented. The information gathered is essential for any further conservation actions and management decisions related to the agricultural or other activities in the area. The monitoring results obtained so far are presented and discussed.

## 19. Mainstream Plant Key Biodiversity Areas (KBAs) into the National Conservation Planning Framework

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Jordan includes four biogeographical regions and thirteen different vegetation types with 2,551 vascular plant species representing 1% of the world's flora. Similar to many other parts of the world, Jordan is facing serious environmental challenges caused by increasing population, expanding human activities on natural and agricultural lands, in addition to the impacts it endures as a result of global climate change, all leading to increased deterioration of natural habitats, destruction of ecosystems and overuse of their services, and loss of wildlife and genetic resources. The Royal Society for the Conservation of Nature (RSCN) has developed a joint conservation initiative in partnership with Birdlife International and Conservation International under the framework of the Critical Ecosystems Partnership Fund (CEPF) with the aim to “Mainstream Plant Key Biodiversity Areas (KBAs) into the National Conservation Planning Framework”. Through this project, many goals were achieved, the most important of which are: 1. Enhanced knowledge and understanding of the Plant Key Biodiversity Areas (Plant KBAs) within the Mediterranean Hotspot in Jordan. A booklet in Arabic language for the plant KBAs in Jordan was prepared to address the wider community. 2. Based on the distribution of trigger species listed the four plant Key Biodiversity Areas (KBAs) were identified through the application of the global KBA criteria and while taking into consideration the manageability and conservation potential of these areas. 3. KBA land-use guidelines were prepared in order to be integrated into the national land-use plan ensuring that these KBAs will be sustainably managed, and their biodiversity elements are conserved. 4. Build the capacity of national government, non-government, and academic institutions on the application of the global guidelines and best practices related to KBAs identification, assessment, delineation, and legal integration.

## 20. Climate change impacts and extinction risk assessment of three Greek endemic species: *Nepeta camphorata*, *Nepeta orphanidea* and *Nepeta scordotis*

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*Nepeta* is a highly complex and frequently hybridizing genus, due to its inter- and intra-specific morphological variability and its weak pre-/post-zygotic barriers, thus rendering its taxonomic distinction difficult and as a result, this genus is rather understudied in Greece. 60% of the taxa belonging to *Nepeta* are narrow Greek endemics. In the framework of the ongoing Flora of Greece project, we aim to untangle the morphological, phylogenetic and ecological complexities of this taxonomically intriguing genus. As Greece is already facing the short-term impacts of human-induced climate change, studies dealing with the potential, long-term climate change effects on endemic plant species distribution are urgently needed to lay out efficient conservation management plans. Herein, we investigate how might climate- and land-use change alter the distribution of three narrow endemic plant taxa, namely *Nepeta camphorata*, *N. orphanidea* and *N. scordotis*, based on bibliographical and our own field data, via a species distribution modelling approach in an ensemble modelling framework and soil, topographical and bioclimatic variables as predictors. Moreover, based on the IUCN Criteria A and B, we estimated the current and future extinction risk of the aforementioned taxa. It is highly probable that *N. camphorata*, *N. orphanidea* and *N. scordotis* will experience considerable area changes in the future and will be facing high extinction risk.

## 21. Germination capacity of ten endemic and endangered species of Sardinia (Italy) after long-term storage in the seed bank

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The conservation of endemic and endangered plant species is of great interest for the scientific and research community. In this frame, seed banks have a crucial role if biodiversity preservation and climate change are considered. The study of seed viability during storage conditions provides basic and useful information to ensure the *ex situ* conservation of endangered species. The aim of this research was to evaluate if the time and methods of preservation (i.e., base collection at - 25°C and active collection at + 5°C) may affect the long-term seed germination. To evaluate this, ten Sardinian endemic species with orthodox seeds, most of them endangered, were studied: *Astragalus maritimus*, *A. verrucosus*, *Brassica insularis*, *Centranthus amazonum*, *Dianthus morisianus*, *Digitalis purpurea* var. *gyspergerae*, *Ferula arrigonii*, *Helicodiceros muscivorus*, *Iberis integerrima* and *Verbascum plantagineum*; these species were stored in the Sardinian Germplasm Bank (BG-SAR) at - 25°C and at + 5°C for a range from two to 12 years of storage. Germination tests were carried out with the same methodology for all the species. In addition, the seeds of the two *Astragalus* species were previously subjected to mechanical scarification to break physical dormancy. The results showed, in general terms, the high germination capacity of all species stored both at - 25°C and at + 5°C; regarding the years of preservation, the germination of some tested species (as in *B. insularis* and *C. amazonum*) slightly decreased with the time of conservation. We argue that the seed dehydration and the low seed moisture content during storage can be considered key factors for long-term conservation of these orthodox seeds. In conclusion, this study showed that the preservation of these endemic species is guaranteed, reinforcing the general opinion that the longevity of the seeds depends on the quality of the seed lots and the conditions of pre- and during storage.

## 22. Use of mycorrhizae to increase survival and resilience of transplanted plants in habitat restoration practices.

Iannaccone Marco, Lamoliere Arthur, [Buhagiar Joseph](#)

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The UN's 2030 Agenda for Sustainable Development calls for the preservation of biodiversity, which is threatened due to habitat degradation and climate change. Actions to enhance restoration and resilience of habitats to reduce biodiversity loss are needed. Though *in situ* conservation is considered the best way to preserve biodiversity where species can persist with all their natural ecological interactions, the latter element is often ignored. Criticalities can arise when *ex situ* grown indigenous plants are translocated *in situ*, without their natural soil microbial associations, especially in a Mediterranean climate where abiotic stresses are severe. Mycorrhizal Fungi (MF) are fundamental for terrestrial ecosystems, enhancing plant productivity, alleviating abiotic and oxidative stress, and regulating macronutrients recycling. The aim of the project was to investigate the use of indigenous MF to enhance acclimatization and survival of *ex-situ* grown plants translocated for habitat restoration. The seeds of *Pinus halepensis* and *Quercus ilex* as well as sporocarps of naturally associated indigenous MF *Suillus collinitus* and *Pisolithus arhizus* were collected in Natura2000 sites in the Maltese Islands. Seeds were germinated under greenhouse conditions and MF were inoculated on the above-mentioned plant species at seedling stage. For *Pisolithus arhizus* was possible to inoculate *Quercus ilex* also at seed sowing stage. For *Suillus collinitus*, fragments of the ripe sporocarps were placed in *Pinus halepensis* seedling trays. At evidence of mycorrhization, the *Suillus collinitus* was inoculated on more *Pinus halepensis* seedlings through Mother Donor Plant technique. The growth performance of mycorrhized plants in the nursery, followed for a period of at least one year, showed better growth performance and survived periods of summer heat waves better than non-mycorrhized plants. All the mycorrhized plantlets produced will be reintroduced next fall into selected area of Natura2000 in the Maltese Islands as part of SiMaSeed restoration project.



## 23. Use of morpho-colorimetric analysis to monitor germination success of hydro-primed seeds of *Coronilla valentina* subsp. *glauca* (L.) Batt.

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The Mediterranean basin is a biodiversity hotspot where many species are under threat and action for restoration is needed. One of these species is *Coronilla valentina* subsp. *glauca* with localised distribution in the Maltese Islands. Seed priming is the control hydration of seeds in water or a solution of low osmotic potential to initiate the germination metabolism before sowing. Hydro-priming is an economical technique which improves seed-water-uptake efficiency and is useful in areas with unpredictable biotic stresses namely high temperature and drought. The aim of the project was to investigate if the germination rate of *C. valentina* seeds subjected to extended hydro-priming increased. Analysis of hydro-primed seeds was carried out by using morpho-colorimetric to analyse the imbibition rates at different time hydration intervals. Seeds which had not been hydro-primed represented the control. The seeds of *C. valentina* were collected at the Wied Babu Natura2000 site of the Maltese Islands. Seeds were examined, dried at 30°C and cleaned. Seeds were soaked in water kept at three different conditions before sowing under controlled conditions. Seed batches in four replicates of 25 each were subjected to three pre-treatments, namely: soaking in water at room temperature (24°C); standard overnight soaking in warm water at 75°C which was allowed to cool gradually; water kept at 40°C, in the last two cases four different hydration time intervals (24h-48h-72h-96h) were also tested. At the end of each soaking time interval, seeds were analysed for morpho-colorimetric changes using ImageJ analysis to observe changes in colour as well as in size. Germination was then recorded weekly. All the seedlings produced will be used for reintroduction into selected areas of disturbed Natural 2000 habitats in the Maltese Islands as part of SiMaSeed habitat restoration project.

## 24. Successful eradication of IAPs requires interventions at their most vulnerable stages.

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IAPs in at least 19 families have been recorded from the Maltese Islands. IAPs are invasive to different degrees, and eradication depends in part on propagule pressure and difficulty to remove their biomass including their rooting apparatus. Choosing the correct strategy for eradication varies by family and species and should centre on the IAP's most vulnerable life cycle stages which may relate to time of the year when to reduce vegetative spread, harvest seeds, cutting out inflorescences, offshoots, etc. IAPs are vulnerable to different degrees and much akin to warfare, this vulnerability needs to be exploited. Our project focused on the removal of IAPs in five different Families starting with the identification and status of IAPs in N2K sites, study of reproduction, assigning a vulnerability index and planning a strategy for removal. Seed/propagule collection followed by removal of above-ground biomass is followed by work on below ground apparatus if this is of relevance, removal of new sprouts and seedlings especially if the removal of the mother plant triggers the soil seedbank to start germination as in the case of *Acacia* species. For such IAPs the best time to remove the mother plant would be at the onset of the rainy season in September. In our interventions on *Agave*, *Acacia* and *Cardiospermum* in the Wied Babu N2K site more than 4 truck-loads of biomass were removed from 1.5 km<sup>2</sup> of disturbed habitat and now are ready for replanting with indigenous plants as part of the SiMaSeed project.

## 25. A promising path for *in situ* conservation, the development of an integrated chain of actors in ecological restoration – from collection to support for project leaders

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The *in situ* conservation of Mediterranean plant species is certainly one of the most interesting ways of conservation, and recommended by the Global Strategy for Plant Conservation (GSPC) (target VII), it remains severely limited by various constraints: accessibility and availability of sites, significant economic costs (installation, monitoring, maintenance, etc.), natural risks, and the number of experiments carried out in Mediterranean territories compared to what should be done to prevent extinction of many plant species remains low. The involvement of a chain of actors engaged in ecological restoration projects, from collection to the establishment of favorable habitats, including technical support from the design, to the establishment and monitoring can constitute a promising path by removing some of these constraints. This is the approach undertaken by entrepreneurs from the Terracoopa cooperative in Occitanie (France) combining their skills in the production of local plant material, in ecological engineering, and in agroforestry, and restoration of forest ecosystems. The supported projects are not limited to the only obtaining of conventionally expected ecosystem services (increase in biodiversity, soil restoration, carbon storage, anti-erosion control) but also integrate the purposes of complementary production and agricultural diversification, which may constitute additional incentives and financial compensation for owners in particular canvassed and solicited. We present some case studies with potentially interesting species with an integrated approach: (a) identification of areas of interest, collection, selection, (b) nursery cultivation, (c) establishment (in connection / upstream design and diagnosis), (d) assisted natural regeneration (ANR), (e) monitoring, maintenance and assessment. Finally, in particular to assess the effectiveness and impact of the proposed solutions, additional research contributions in ecology, phytosociology, plant dynamics, would be very useful.

## 26. Management actions to achieve Favourable Conservation Status for the priority plant species of the Habitats Directive *Androcymbium rechingeri* Greuter (1842) in Greece

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*Androcymbium rechingeri* Greuter is a range restricted geophyte. It occurs only on sandy beaches and coastal areas in West Crete, Greece: Elafonisi islet, Elafonisi beach, Falasarna beach and Imeri Gramvousa islet and it has also been reported in coastal areas of Libya. *A. rechingeri* has been categorized as Endangered according to the IUCN Red List and the Red Data Book of Greece (1995). It is listed as priority species in Annex II of the Habitats Directive and is protected by the Greek Presidential Decree 67/81 and the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). In Greece, its habitat is adequately protected at the locations on the islets. However, there is continuous decline at Elafonisi and Falasarna beaches due to recreational activities and tourism, overgrazing, agricultural activities and construction of roads, parking areas and other facilities. Past conservation actions include the creation of a Plant Micro-Reserve for *A. rechingeri* on Elafonisi islet, *ex situ* conservation in seed banks, study of its germination biology and experimentation to establish an optimum population reinforcement protocol. New management actions are currently in progress with the aim to achieve Favourable Conservation Status for the species. The actions include fencing and designation of pathways in the highly touristic areas of Elafonisi and Falasarna beaches, re-establishment of the plant population at part of Elafonisi beach, seed collection from all subpopulations for *ex situ* conservation, trainings in long-term monitoring of the *in situ* conservation actions, and raising awareness of the residents and visitors. The current project is implemented by the Mediterranean Plant Conservation Unit of MAICH in close collaboration with the Decentralised Administration of Crete - Forest Directorate of Chania, the Management Body of Samaria National Park – West Crete and the Municipalities of Kantanos-Selino and Kissamos.

## 27. *In situ* studies on two of the most critically endangered endemic Spanish plants

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*Gadoria falukei* Güemes & Mota and *Cistus heterophyllus* subsp. *carthaginensis* (Pau) M. B. Crespo & Mateo are two of the most critically endangered species of Spain. *Gadoria falukei* is an autogamous species that present only one population with less than 100 individuals. *C. heterophyllus* subsp. *carthaginensis* presents high levels of autoincompatibility and there are two natural populations, one in Murcia with high levels of hibridization with *Cistus albidus* and one in Valencia with only one individual. To improve the knowledge of the species have been conducted reproductive studies. The two species present very few genetic diversity. *G. falukei* produce numerous fruits and seeds and present high levels of germinability (tested on the lab). The population growth in a cave divided on three areas, the two more accessible areas nowadays present 59 individuals and 31 of them have reproduced this year. During the census, the death of one adult plant, three new plants and some seedlings have been observed. *C. heterophyllus* subsp. *carthaginensis* behave in a different way for the two locations. The Murcian ones produce 67% of the fruits, with a mean of 36 seeds and have observed recruitment of seedlings. Instead, the Valencian translocation studied (produced from the only one natural plant) produce only 15% of fruits with a mean of 20 seeds. Only 6 seedlings were observed, but none of them survived. Were conducted six pollination treatments and only 10% of them produced fruits, being the xenogamy treatment the one that produced higher fruit set (21,13%). *G. falukei* present few individuals but we started to observe new plants. Instead, even if in Valencia there are hundreds of *C. heterophyllus* distributed on different translocations we cannot speak of improving of the conservation status, as there is not recruitment. We need to continue to study these populations to observe its evolution.

## 28. Restoration of Mediterranean temporary ponds (\*3170) in “Bosco di Palo Laziale” (SCI IT6030022)

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Mediterranean temporary ponds are endangered ecosystems, characterised by numerous plant species and interesting animal communities. They are indicated as priority by EU Habitats Directive. Protection, restoration, and creation of temporary ponds is difficult. They are usually small and shallow bodies of water, which dry completely in the dry season. The length of the flooding period has a strong influence on the floristic composition and must be finely calibrated to avoid a floristic impoverishment. Palo Laziale is a natural protected area in the North of Rome that has been part of a Life project aimed at preserving and improving the existing temporary ponds. In the area, many species of *Isoëto-Nanojuncetea* class and abundant populations of *Isoëtes* spp. are present. The habitat was probably more widespread in the past before reclamation of the marshes, improper water management and global change causing an increasing evaporation. In the framework of this project the excavation of three new temporary ponds was carried out, to improve the existing communities of plants and set up new area for future translocation actions. The ponds were created according to different criteria and where the presence of clay in the soil allows water to stagnate. They differ for extension, depth, and position in the area. Moreover, species colonisation was observed with a set of random plots. A first monitoring shows that all ponds have been colonised by habitat species. One pond resulted in a more effective conservation of plant communities and there are twice the number of species than the other ponds. Conversely another pond resulted in a more effective conservation of rare amphibians. The monitoring activities are still ongoing, but the colonisation by temporary ponds' species confirms the pioneering aspect of the habitat, and restoration actions must consider successional stages that may exclude these communities.

## 29. Life Floranet: a project for the conservation of plant biodiversity in the Italian Apennines

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The main aim of the project Life Floranet is to protect and improve the conservation status of seven plant species of EU importance (Annexes II-IV to Directive 92/43/EEC) within the Natura 2000 areas of the Central Apennines (Italy): Maiella National Park, National Park of Abruzzo, Lazio and Molise, Sirente-Velino Regional Park. The selected species investigated in this project are: *Cypripedium calceolus*, *Adonis distorta*, *Androsace mathildae*, *Iris marsica*, *Astragalus aquilanus*, *Klasea lycopifolia*, and *Jacobaea vulgaris* subsp. *gotlandica*. The actions carried out are: *in situ* and *ex situ* conservation, tourism impact reduction, awareness campaigns among stakeholders. These strategies are essential to perform concrete actions for effective species conservation. Specifically, for each species, we performed: seed collection, *in vitro* propagation, seed reproduction, long-term storage, *in situ* restocking, and the creation of new populations. Within this project, which is still in progress, 10 restocking actions were carried out within the Central Apennine Chain. To date, eight accessions of the Maiella Seed Bank have been used for these actions. Until now, only 64 (0.09%) out of 67,620 seed accessions of native plants stored in European seed banks (ENSCOBASE) were used in translocation programs. In this context, the Floranet project plays a crucial role in implementing conservation strategies and monitoring endemic or rare species, reducing their extinction risk. These actions strengthen the conservation role of the Maiella National Park through an integrated conservation strategy combining *in situ* and *ex situ* activities.

### 30. Conservation of endemic, rare and threatened plant species on Mt. Orjen (SE Dinaric Alps, Montenegro)

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Various threats to endemic plants, such as deforestation, afforestation, urbanisation and vegetation burning, have been identified as a major threat to the Mediterranean biota. On Eastern Adriatic problems were also identified in Montenegro: lack of basic information on endemic, rare and threatened plant species, lack of capacity in research and conservation methods, as well as identification of concrete problems, design of conservation measures and activities for protection. In the period 2019-2022, research and conservation activities of endemic, rare and threatened plant species have taken place on Mt. Orjen, one of the floristically and vegetation rich mountains in the border area between Bosnia and Herzegovina and Montenegro, with special focus on *Iris orjenii* (restricted to few sites on Mt. Orjen with a small number of specimens) and some other rare, endemic and/or threatened plant species (e.g. *Satureja horvatii*, *Linum elegans*, *Salvia brachyodon*, *Dianthus knappii*, *Hyacinthella dalmatica*, *Aquilegia grata* subsp. *nikolicij*, *Scilla litardierei*, *Edrianthus serpyllifolius*). The hitherto provided activities on Mt. Orjen, which is protected in Montenegro (EMERALD and IPA site, a future NATURA 2000 site), has shown that the long-term impact on efficient conservation of the biota must include the integration of the gained knowledge, proposed activities and measures into the management plan of this area with the involvement of experts and local stakeholders (locals, mountaineers, hunters, nature lovers, volunteers, etc.).



## 31. Conservation strategies of threatened species should consider their dispersal ability

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<sup>1</sup>University of L'Aquila, L'Aquila, Italy, <sup>2</sup>Maiella Seed Bank, Maiella National Park, Sulmona, Italy

Many plant species are at risk of extinction because of climate change. To identify effective conservation strategies, seed dispersal is a crucial trait to predict the future distribution of threatened species. Indeed dispersal is essential for species to survive the threats of habitat destruction and climate change. Even though this trait is essential for plants, it is rarely measured or incorporated into species distribution models. Species distribution models (SDMs) can rank habitat suitability at a local scale, and they may be a valuable conservation planning tool for rare, patchily distributed species. Combining dispersal ability and habitat suitability at the landscape scale is important to understand and predict species spatial responses to environmental change. This study analysed future species distributions for seven endangered and vulnerable taxa being part of Floranet Life Project. In this work, we have combined SDM and dispersal ability to predict the range of species distribution across central Italy in the near future 2050. Due to the low number of occurrences, we performed the Ensembles of Small Models (ESMs) using the bioclimatic variables from WorldClim 1.4. The study identified the most suitable area for this species in the central Apennines. The innovation of this study is the combination of SDMs with dispersal ability based on measured traits of local populations of rare species and subspecies. The main results show a combination of climate change with dispersal ability strongly affects the future potential distribution of the rare species. Thus, obtaining suitable and accessible areas in the near future is possible to identify the high suitable sites for the reinforcement of the natural population, ensuring habitat connectivity. Moreover, this methodology can address new conservation strategies to reduce the extinction risk of many threatened species.

## 32. An update on the status of *ex situ* conservation of Crop Wild Relatives (CWRs) of the Italian flora in the Italian network of seed banks (RIBES)

Villani Mariacristina

Botanical Garden of University of Padua, Padua, Italy

Among European countries, Italy holds an extraordinarily high level of plant diversity, both in native species and cultivars. These two components are linked by CWR, wild species genetically related to cultivated crops. Conservation efforts on CWR are generally negligible, despite their importance and the increased levels of threats they are subject to. Further investigations are required to account for their presence in RIBES seed banks, and hence to set conservation strategies and priorities. The most comprehensive national inventory of CWR/WHP (Ciancaleoni et al., 2021) lists 6,839 taxa as CWR. This database was cross-referenced with other checklists, such as the new Italian Red List (Orsenigo et al., 2020) extracting their risk category, and the endemism level (Peruzzi et al., 2014). The list of the taxa and accession conserved in Ribes' seed banks has been produced. A cross-reference with the FAO list of CWR (2001), carried out in 2016 (Magrini et al., 2016) was also taken into consideration. Our results provide a sound basis for future seed collecting campaigns aimed at their ex-situ conservation in Italy. This action represents an effective contribution to the National Crop Wild Relative Strategy for Italy (Panella et al., 2014, Labokas et al., 2018, Perrino & Wagensommer, 2021).

### 33. Protected Area Participative Management: a tool to protect plant biodiversity in Cabo Verde

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In Cabo Verde, Sal Island is the most touristic and fast developing island of the archipelago. Tourism industry benefits from the biodiversity and the Protected Areas, with most of the guided excursions taking place within them. This, together with illegal sand mining, has been degrading key habitats for plants, birds, and reptiles. In the south-east coast, near the touristic location of Santa Maria, the Protected Area of Costa da Fragata is also identified as a Key Biodiversity Area for its plant biodiversity, including 8 endemic species. Composed by a coastal dune ecosystem and a sand corridor, this area is also important to mitigate some of the impacts of Climate Change. But the national and local authorities of Cabo Verde are struggling to manage the network of Protected Areas. This project aims to support authorities to manage the Protected Area of Costa da Fragata in a participative together with the private sector. At the same time, initiatives to protect and restore the habitat are taking place while monitoring is established and improved. Plant biodiversity has been mapped, with a better idea of its abundance and distribution. Threats were identified and priority areas delineated. In total, 45 plant species were registered, from which 8 endemism of Cabo Verde. A regular monitoring of infractions and area use will be key for the recovery of the habitat, as well as more interventions to order its use to make it more sustainable.

## PROJECTS MARKET PLACE (POSTERS)

### M-2. Population characteristics of *Juniperus drupacea* at the westernmost area of its world distribution (Mt. Parnon, Greece)

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*Juniperus drupacea* Labill. is a relict, dioecious tree/shrub found in Turkey, Syria, Lebanon and Israel, while in Europe it is native only in Greece (on Mt. Parnon and in a small part of Mt. Taygetos). Its height may reach 20 m and it is usually multi-trunked, with a DBH up to 105 cm. In Europe, according to the IUCN Red List criteria, *J. drupacea* has been characterised as endangered (EN), the greatest threats being grazing of saplings, overexploitation of its wood and climate change. For the first time, and within the framework of the JUNIFOR Project "Assessment of the structure and dynamics of *Juniperus drupacea* populations and the reproductive biology of the species" (implemented by OIKOM LtD and funded by the Action: Subvention of Parnon, Moustos, Mainalon & Monemvasia Management Body for Management Measures of the Protected Areas, Species and Habitats)\*, the structure of the various stands of *Juniperus drupacea* across its entire population on Mt. Parnon is being studied. The selected monitoring sites (20 × 25 m) cover fully the geographic distribution of the species as well as the heterogeneity of its habitats, in Mt. Parnon. The morphometric traits (gender, individual height, canopy diameter, DBH, number of trunks) for each individual from all 13 sites were recorded during 2020 and 2021. In addition, cone-bearing (mature cone production) of 10 tagged, female individuals from each transect were assessed during 2021 and will be monitored in the following years. Regarding cone and seed morphology, 20 random, mature cones have been gathered from each site during 2020 and their characteristics have been analysed. Results obtained so far will be presented and discussed. \*This research is co-financed by Greek national funds and the European Union-Cohesion Fund, through the Operational Program Transport Infrastructure, Environment & Sustainable Development (Partnership Agreement 2014-2020).

### M-3. Conservation and restoration of relict *Taxus baccata* woods in the Valencian Region (East of Spain)

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The Mediterranean *Taxus baccata* woods are a relict plant community, included as priority habitat in the EU Habitats Directive. The European Environment Agency considers that its current conservation status, “structures and functions” and “future prospect” in the Mediterranean biogeographical region is U2 (Unfavourable-bad). This communication presents the efforts under development by the environmental administration in the Region of Valencia, Spain to improve its conservation status in the context of the recently approved LIFE Teixeres project (LIFE20/NAT/ES/001128). The main identified conservation threats in the Valencian region are habitat fragmentation, small population size, low seed productivity and recruitment, herbivory and trampling by wild fauna, climate change and wildfires. The project proposes several conservation measures to correct its extreme fragility. These include forestry treatments to reduce competition and wildfire risk, germplasm collections for plant production and ex-situ conservation at the Valencian Forest Seedbank from the different provenances inside the Valencian Region, plant production in the public nurseries, population reinforcements with 37 key habitat species and the creation of quasi insitu new populations of the main species *T. baccata* in controlled seed producing orchards. Besides from yews, these orchards will also include other fruit producers that are meant to attract seed dispersers and increase ecological interactions. This new sites are going to be placed in agricultural terraces close to the natural populations and will serve as cores for natural seed dispersal. The yew plants used for the orchards will be obtained vegetatively from the natural populations in order to have quicker seed production by shortening tree maturity. Farmed orchards will also allow bigger seed yields than natural populations, reducing seed collection pressure for conservation purposes.

## M-4. Djerba "la douce", the island of *Limonium*

Ben Haj Jilani Imtinen<sup>1</sup>, Sefi Ons<sup>1</sup>, Ben Khalifa Safa<sup>2</sup>, Meddeb Sahar<sup>2</sup>, Daoud-Bouattour Amina<sup>3</sup>,  
Ghrabi-Gammar Zeineb<sup>2</sup>

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Djerba, the largest island of the North African coast, is located in the southeast of Tunisia. It is classified as a Key Biodiversity Area, Important Plant Area and endowed with three Ramsar sites. The island has a major interest in terms of conservation, which motivated the implementation of the project "Improving knowledge on the flora of the island of Djerba and the conservation status of its heritage species". This project is coordinated by the Association Research in Action (REACT), in close collaboration with the Association for the Protection of the Island of Djerba (ASSIDJE), and is funded by the Critical Ecosystem Partnership Fund (CEPF). Djerba harbours a rich and diversified vascular flora (about 408 taxa), with 7 Tunisian endemic taxa including 5 *Limonium* species. Two of them (*Limonium formosum* Bartolo, Brullo & Giusso and *L. menigense* Brullo & Erben) are restricted to the island. Recent botanical investigations allowed us to update the data on the 11 *Limonium* species inhabiting the island. A new species for science, *L. steppicum* Sefi, Ghrabi-Gammar & Brullo, was discovered and described, while the endemic *L. menigense*, not found again, was classified as globally extinct. An ex-situ multiplication trial was set up for *L. formosum*, with the aim of its reintroduction into other similar habitats on the island. Training sessions were conducted for associations active in the protection of biodiversity to monitor population and habitat trends of this taxon. A participatory creation plan of a micro-reserve for the in-situ conservation of *L. formosum* has been drawn up, a charter with local organizations for its implementation is being prepared. Djerba, the island of lotophagi, certainly hides other secrets. This is what we will try to decipher by combining botany and ethnography, and by touching on the interrelationships of the autochthonous inhabitants with the plants and the use they make of them.

## M-5. The project RIVALSA – An integrated approach for the revegetation of coastal dunes altered by alien species

Magrini Sara<sup>1</sup>, Canini Fabiana<sup>2</sup>, Alonso Simón Ana<sup>1</sup>, Attorre Fabio<sup>3</sup>, Fabrini Giuseppe<sup>3</sup>, Zucconi Laura<sup>2</sup>

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Alien species are one of the greatest threats to native vegetation. Coastal dune habitats are especially fragile and vulnerable to biological invasion. Two of the most aggressive alien species are *Carpobrotus edulis* and *C. acinaciformis*, native to South Africa and introduced in Mediterranean Europe to stabilise sandy areas and for ornamental purposes. They grow easily, spreading rapidly, and depriving native species of water, nutrients, and space. They become invasive, often replacing native plants and reducing biodiversity. Moreover, *Carpobrotus* litter has an allelopathic effect, reducing the germination and establishment rates of native species. However, the edaphic-topographic, chemical, and microbiological characteristics of the soil are essential for the success of *Carpobrotus*. In particular, soil fungi can act in multiple ways, influencing the overlying plant community. Thus, the aim of the project is to develop an integrated plant and fungal approach for the revegetation of coastal dunes altered by alien species to counteract the spread of the invasive *Carpobrotus* species. Some intermediate objectives have been proposed to achieve this goal: 1. To select a fungal consortium composed of strains resistant to the *Carpobrotus* allelopathic substances; 2. To select a pool of wild plant species whose seeds can tolerate the presence of allelopathic substances in the soil; 3. To select the fungal consortium that ensures the highest percentage of seed germination and seedling survival in the presence of the allelopathic substances; 4. To test the validity of the selected fungal consortium on the greenhouse growth of plants in the presence of allelopathic substances. Hence, it will be possible to identify a set of native species whose seeds are not inhibited by *Carpobrotus* extracts. They can be used, together with the fungal consortium, for the reconstitution of dune vegetation after the eradication of *Carpobrotus* species, increasing their probability of success.

## M-6. Reinforcement of quillworts – *Isoëtes* spp., and other keystone species of Mediterranean temporary ponds (EU habitat type \*3170) in Palo Laziale, Rome, Italy (Natura 2000 site).

Cambria Vito Emanuele, [La Montagna Dario](#), Fabrini Giuseppe, D'Arpe Elisabetta, Fanelli Giuliano, De Sanctis Michele, Attorre Fabio

Botanical Garden of Rome, Department of Environmental Biology, Sapienza University of Rome, Rome, Italy

Transitional wetlands and coastal forests are among the most degraded and threatened ecosystems in the European Union. This has resulted in many habitats and species in Mediterranean coastal areas having 'unfavourable', 'vulnerable' or 'near threatened' conservation status according to the EU Habitats Directive (92/43/EEC). Actions to improve habitats' conservation status are particularly needed in the 'Bosco di Palo Laziale' Natura 2000 site in Italy. It covers 50 ha and is largely composed of the habitat type 'Pannonian-Balkanic turkey oak-sessile oak forests' (91M0) and transient habitat types particularly rich in biodiversity, such as the 'Mediterranean temporary ponds' (\*3170). These habitats, and the associated wildlife, face several serious threats, including bush encroachment, climate change and inappropriate forest and water management. In the framework of the project LIFE PRIMED (LIFE17 NAT/GR/000511), a set of traditional and innovative ecological restoration practices are under implementation in Palo Laziale to improve the conservation status of its habitats and species. These interventions include, among others, ex-situ micro-propagation and in-situ reinforcement of keystone plants of the Mediterranean temporary ponds. In the germplasm bank of the Botanical Garden of Rome, the reproduction strategies of the genus *Isoëtes* are under testing and evaluation. Simultaneously, a new temporary pond was created in a flat area of about 1500 sqm of Palo Laziale to meet the species' ecological requirements (i.e. soil and topographic conditions). This pond will host the young quillworts and other keystone species of habitat 3170 produced at Rome's Botanical Garden. The outcomes of these ex-situ and in-situ practices will enable the development of sexual and asexual reproduction protocols and field operations guidelines to support the reintroduction and/or reinforcement of native plant populations of standing freshwater habitats elsewhere in Europe.



Friday 1 October 2021

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## SESSION 3

# Networking - learning and communication

**Chair:** Pierre Carret

Scientific and technical aspects alone are not sufficient to ensure effective and sustainable conservation of the flora. The exchange of information and best practices between experts is essential. However, raising the awareness of all stakeholders and the general public is also crucial. Finally, finding funding for conservation projects is an ongoing challenge. This session will allow participants to learn more about these different subjects from specialists and to deepen their knowledge.

## ORAL PRESENTATIONS

### What are the main networks, projects, plant conservation initiatives in the Mediterranean

Cañas Mercedes Muñoz

IUCN Centre for Mediterranean Cooperation, Málaga, Spain

Networking is a need undeniable for effective conservation. Thanks to it we are able to increase the common learning and the scalability of our results. Up to date many initiatives and proposals require connections of experts and exchanges to better understand the challenges presented. This is why it is important to be informed about the main networks, projects and initiatives. To be ready for new opportunities and ways of collaboration. Connecting with each other around plant conservation to improve biodiversity and nature protection. Different initiatives, networks and projects related to plant conservation from the Mediterranean will be explained and discussed with the participants.

PIM (Small Mediterranean Islands Initiative),  
network of experts for the collection of  
environmental data from un-known Mediterranean  
islands – Initiative PIM

Thévenet Mathieu, Tankovic Eva

Initiative PIM pour les Petites Iles de Méditerranée, Marseille, France

Concrete conservation actions on the ground would not be possible without the development of partnerships and active networking of all type of actors working towards the same objectives. Networks are particularly important in islands, as these areas are involving numerous stakeholders, from scientists to institutions. Achieving concrete conservation results require collaboration between civil society, institutions, scientists, managers, etc. and setting up an effective cooperation system between all is often not an easy task, but when successful, it can be amazingly efficient. Building strong networks is the occasion to promote synergies, fully taking advantage of opportunities for collaboration, knowledge exchange, communication, fundraising and cross-learning. Networking for conservation allows to gather the most current and expert information about conservation and priorities for action. In Tunisia, for more than 10 years, civil society, institutions and scientists are working together to build up co-management system of the Tunisian islands. Exchange of knowledge and know-how between conservationists and specialists in the Mediterranean have been the occasion to implement several naturalist expeditions on Tunisian islets, leading to the compilation of massive data and the publication on the Monograph of Tunisian islands. All along Mediterranean islands, local NGOs joined forces for the protection of islands wetlands, gathering information about their localisation, threats and impacts. The effective collaboration between partners, working together applying the same methodology gave the opportunity to create synergies and strong links with key stakeholders, to communicate about the existence and importance of island wetlands, preparing the ground for promoting conservation measures and highlighting the priority areas for restoration. Fully taking advantage of this partnership, several good cases of restoration are currently implemented in island wetlands, with the objective to be replicated in other sites with the strengthening of the partnership.

## Tela Botanica - a network for botanists to promote the exchange of information and to animate projects through new communication technologies

Girod Christophe

Tela Botanica, Marseille, France

Tela Botanica is a network of French-speaking botanists. For 21 years, professionals and the general public interact to exchange data, collect information and build up collaborative projects. There are more than 56 000 persons registered in the network from nearly 100 countries. Each person contributes voluntarily their own skills to the development of flora knowledges. Tela Botanica leads expert projects, as the workshop for the constitution of taxonomic referentials for the European flora, particularly the French one (BDTFX). Tela Botanica works also for the large access of botany knowledge (Free license) and to involve all persons regardless of their level in botany. Today, through its website [www.tela-botanica.org](http://www.tela-botanica.org), the association provides botanists with many tools to facilitate exchanges and sharing of knowledge about plants: floristic observations, weekly news, bibliographic databases, cooperative “workshops”, MOOC (Massive Open Online Course), etc. A botanical and online encyclopedia (eFlore) brings a wealth of information on the flora from France and Africa. Furthermore, the association is heavily involved in citizen sciences and provides botanists with its expertise in leading collaborative projects in communication and information technologies. Tela Botanica provides the general public and naturalists associations with input tools easy to use that allow massive data input. As many people participate, a large amount of data is collected in a free way (Open data) and directly published on Tela Botanica’s website. To overcome the problem of data validation, the team develops various tools for determination assistance (identification tool, determination groups, distribution maps, photographs): a fascinating data process that we will introduce to you.

## Higher Education Innovation in Plant Diversity. The blended program HEIPLADI developed within the Erasmus+ K2 Strategic Partnership

Scippa Gabriella Stefania

Bioscienze e Territorio, Università del Molise, Pesche, Italy

The project HEIPLADI (Higher Education Innovation in PLant Diversity: flexible learning paths for emerging labour market), was funded by the Erasmus+ K2 strategic partnerships (2015-2018) and aimed at developing, testing and implementing a higher education program on plant biodiversity evaluation, conservation and management. Higher education program, included the use of ICT techniques in a blended path of virtual and physical mobility. Throughout a successful constructive cooperation and integration between expertise of Botanic Gardens and Germplasm Banks from five Universities [Molise (IT), Cagliari (IT), Lisboa (PT), Malta (MT), Sofia (BG)], and two research institutes [Mediterranean Agronomic Institute of Chania (GR), Centre for Biological Diversity Conservation in Powsin (PL)], the project implemented a flexible program that includes five e-learning modules (virtual mobility) and seven practical activities (physical mobility). The e-learning modules are available as “open access” on the Moodle platform (<https://dibt.unimol.it/HEI-PLADI/home/>) and thus usable by students, educators, technicians working in laboratories, herbarium, museum, germplasm banks and botanical gardens at national and international level. Beside the implementation of the higher education program on plant biodiversity, the project provided: (i) teaching/learning materials usable in courses of established curricula degree, and/or to develop new curricula; (ii) the exchange of the best practices between partners; (iii) the reinforcement of cooperation and integration between European Botanic gardens and Germplasm banks in the field of higher education that may lead to new projects and/or joint international courses such as Master and PhD programs.

**Keywords:** higher education, biodiversity conservation, botanic gardens, germplasm banks

## Why it is critical that we become better conservation communicators

Lázaro Lourdes

IUCN Centre for Mediterranean Cooperation, Málaga, Spain

Communication is an essential, tool for action, raising awareness and fundraising. How well we communicate with each other about plant conservation and nature will affect how well we address the biodiversity conservation crisis. Furthermore, communication is about People, that is the reason why it is easier to communicate with people like us. Now comes the challenge of communicating with people who are not like us. As people are diverse and have different interests for connecting with nature, we need a range of approaches to communicate successfully with different audiences. Different successful and unsuccessful communication experiences and examples from the Mediterranean will be explained and discussed with the participants.

**Keywords:** conservation communicators, communication, media, social networks, data visualisation tools, youth, public awareness, framing nature

## Fundraising and financial instruments – Discussing different approaches to fundraising and important aspects to consider from a donor’s perspective

Carret Pierre<sup>1</sup>, Jbour Sharif<sup>2</sup>, Deschamps Jason<sup>3</sup>

<sup>1</sup> Grant Director, Critical Ecosystem Partnership Fund (CEPF), Chantenay-Villedieu, France, <sup>2</sup> Programme Officer, CEPF Regional Implementation Team (Middle-East), BirdLife International, Amman, Jordan, <sup>3</sup> Programme Assistant, CEPF Regional Implementation Team (North Africa), Ligue pour la Protection des Oiseaux, BirdLife in France, Rochefort, France

Plants can (almost) live out of freshwater and thin air. But plant conservationists can't. In spite of all the passion and commitment of the botanists' community, funds are necessary for conservation action, and fundraising is far from being an anecdotal portion of conservationists' working life. Nevertheless, official "fundraising officer" positions in plant conservation and botanical research institutions are far from being common – and this reflects in the ability of the plant conservation community to efficiently raise funds for action. This lecture is designed to provide the audience with a general guidance for enhancing fundraising skills, illustrated by usual mistakes and good tips taken from real-life examples, and will discuss the donor's landscape in plant conservation.

**Keywords:** Plant Conservation, Conservation Finance, Fundraising

## AFTERNOON WORKSHOPS

### Workshop 3.1 The MOOC potential and how to collaborate on a botany MOOC project?

Tocco Audrey

Tela Botanica, Montpellier, France

Based on its experience with the French-speaking MOOC Botanique "Introduction on plant recognition" (more than 87,000 registrants), Tela Botanica invites you to participate in a workshop to discover the potential of a MOOC (Massive Open Online Course) for the general public and students in the field of botany. A MOOC is an online course. It is open and free for everybody. It is an educational event that doesn't require previous knowledge of the participants. We will discover other MOOC types for professionals and their differences/similarities according to classical MOOC. These online courses are mainly built around educational videos. They are supplemented by documents, games, quizzes, practical activities, etc. A team of facilitators and pedagogues are strongly present on the training forums where participants report on their practical activities and ask questions to progress. Tela Botanica will present how the MOOC Botanique "Introduction on plant recognition" was built on the "Tela Formation" platform and its impacts. The "MOOC Botanique - Academie" (an adaptation of the MOOC Botany for universities and schools) and the "MOOC Botanique 2" will be presented as two opportunities to contribute to a MOOC and develop new collaboration projects on the use of plants, botanical families and plant recognition. In discussion sessions, you will be invited to share your opinions and questions about the MOOC as a training format. You will be able to submit your wish to collaborate on existing or future e-learning projects.

**Keywords:** MOOC, botany, e-learning, collaborative

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## Workshop 3.2 'Plant Blindness' – How to make plant conservation a hot topic – improving outreach and messaging to different audiences

Carret Pierre

Grant Director, Critical Ecosystem Partnership Fund (CEPF), Chantenay-Villedieu, France

While protection of a single large mammal individual can make the head front of newspapers, hundreds of plants species are vanishing without being noticed. At a time when the biodiversity crisis has become obvious to a very large audience, and gathers the attention of governments, foundations and the international community, plant conservation is lagging behind in terms of communication and, consequently, in terms of resource mobilization. During this workshop, we will discuss some of the psychological, sociological, scientific and economic factors contributing to this situation, and explore together how the plant conservation community could do better to build the case for stronger action for the preservation of botanical heritage.

## POSTER SESSION

### 34. From tiny acorns mighty oaks grow

Popović Jelena

Montenegrin Ecologists Society (MES), Podgorica, Montenegro

Our project focuses on Skadar Pedunculate oak monumental trees and on connecting the remainings of their forests. This is endemic Montenegrin subspecies that is present in Central and South-East of Montenegro, on the edges of Skadar lake and its rivers. On the poster first pictures of the acorn collection of the oak trees would be shown, during which meeting of the locals took place. On the pictures locals would show us the biggest pedunculate oak trees in their neighbourhood, and would start to collect acorns themselves. Then the pictures of raising small oak trees from collected oaks by locals would be shown, and collective actions of planting oaks. In the meantime, the picture would be shown of the oak that is, during this project, saved from cutting that was planned during the road construction, in the initiative organised by MES. At the end, picture of the tunnel of the trees would be shown, that yet needs to be preserved during the construction on the other road, as well as the picture of one of the biggest known Skadar Pedunculate oak trees that continually receives care from the local community that lives around it. Pictures would show how poor the status of Skadar Pedunculate Oak forests is in Montenegro, where only individual trees or very small forest fragments are present today. There would be a GIS screenshot that shows how reduced these fragments are, and with lines we would connect them and show the net that should be used as a basis in connecting these fragments). Besides poor status of these forests, poster should show the willingness of locals to be included and be part of the restoration of this species forests.

## PROJECTS MARKET PLACE (POSTERS)

### M-7. Flora and Fauna Preservation Park (Information and Goals)

Zacharouli Antonia

Technical University of Crete, Chania, Greece

Close to Chania, in a protected area of 30 hectares, lays the Flora and Fauna Preservation Park. The Park belongs to the Technical University of Crete and it was conceived and designed by the former rector of the University, Professor Yannis Phillis in 1994. Developed with the partial support of the Pancretan Association of America, the Park was inaugurated in 2004. Inside the Park there is a big organic olive grove of 1000 trees, two ponds that host numerous migratory birds, and various sections of both cultivated and native plants along with small animals, birds and insects that complement the ecosystem. One of the main goals of the Park is to protect the rich wildlife of the island of Crete by its preservation, observation and study. Up to 350 different plant species that grow naturally in the habitats of the Park have been collected and identified, and 1700 dried plant specimens collected from all over Crete are preserved in the Park's Herbarium. Furthermore, in collaboration with UK-based arts organizations Soundcamp and Octopus Collective (Full of Noises) and funded by the Acoustic Commons research program, the Flora and Fauna Preservation Park Soundscape shares a permanent online streaming broadcast for further studying and for backing up a series of educational actions based on acoustic values and biodiversity. More educational initiatives consist of both school guiding and interacting gaming, and public sensitizing to environmental protection. Apart from learning, guests also come frequently to the Park for relaxing, exercising or just to get in touch with nature.

## M-8. ECOlogical VINEyards GOVERNance Activities for Landscape Strategies; Agroecological best practices, landscape enhancement and community participation. ECOVINEGOALS/Interreg Adriatic- Ionian program

Stamataki Eleni<sup>1</sup>, Livieratos Ioannis<sup>1</sup>, Owen Carolyn<sup>1</sup>, Šmid Hribar Mateja<sup>2</sup>, Pio Di Leo Andrea<sup>3</sup>,  
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The ECOVINEGOALS project promotes sustainability and resilience in viticulture, and the protection of habitats and landscapes, by encouraging the agroecological transition of intensive viticulture systems. The project, financed within the INTERREG ADRION Programme, started on March 2020 and will last for 30 months. It combines the expertise of 10 partners from Italy, Croatia, Slovenia, Serbia, Montenegro and Greece, plus 9 associate partners from various countries. The project activities include the identification and appraisal of best agroecological practices already used by viticulture farmers in the partner regions; mapping and assessment of landscapes and habitats in pilot areas as well as participatory governance strategies and actions, to support agroecological transition in vineyards. Through these activities, the project is expected to contribute in the advancement and sharing of technical knowledge and tools and to develop local action plans and transnational strategies to support the agroecological transition of viticulture, the preservation of heritage landscapes and habitats, the valorisation of ecosystem services and the implementation of territorial participatory governance processes in the viticulture areas throughout the ADRION territory. The multi-actor participatory approach chosen by the ECOVINEGOALS project, considers all stakeholders as practitioners, knowledge co-creators to contribute fostering innovation. Eight viticulture areas (the Bio-Venezia District and the Val di Cembra, Italy; the Region of Istria, Croatia; the Crmnica area of Montenegro; the Municipality of Topola, Serbia; the Vipava Hills in Slovenia and the Municipalities of Plataniás and Archanes-Asterousia, in Greece) were selected by the project partners to serve as demonstrative pilot areas. At present, the first phase of surveys conducted to allow multicriteria analysis of the agroecological and economic performance of selected pilot vineyards located in the demonstrative areas was completed. The analysis is underway, along with the landscape mapping and assessment based on GIS data and the perception of key stakeholders within the areas.

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