XIV OPTIMA Meeting

September, 9-15 2013

Palermo

Abstracts

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Regione Siciliana

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XIV OPTIMA Meeting

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Lectures
Communications
Posters

optima
organization for the phyto-taxonomic investigation of the mediterranean area

Orto Botanico, Palermo 9-15 September 2013

OPTIMA (Organization for the Phyto-Taxonomic Investigation of the Mediterranean Area)

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Lectures, Communications, Posters

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Scientific programme

Sunday, 08 September: Commission meetings (restricted)

8:30-18:30 – *Meeting Secretariat*, *Herbarium Mediterraneum, Orto Botanico* – **Registration of the participants.** The Registration desk will remain open as per official programme timings throughout the entire conference.

Monday, 09 September

8:30 – *Orto Botanico*, *Aula Lanza* – Executive Council Meeting (restricted)

10:00 – *Orto Botanico, Aula Lanza* – International Board Meeting (restricted)

12:30 – *Palazzo Steri*, *Sala delle Capriate* – **Opening ceremony, followed by Plenary Lecture** – S. Knapp & al.: "Run for your lives!" – has there been a revolution in publishing and communicating botanical results?

15:00 – *Hall A* – **Symposium 1 - K. Marhold: *New frontiers in Plant Systematics* (IAPT supported Symposium)**

V. A. Funk: Evolution Of Life In Pacific Oceania: A Biogeographic Analysis.

N. Turland: What is the future for biological nomenclature?

16:45-17:15 – Coffee break

K. Marhold: Botanical monography – where to go for future?

C. Oberprieler & al.: Next generation phylogenetics – Inferring species trees and networks from gene trees.

15:00 – *Hall B* – **Symposium 2 - R. M. Ros & M. G. Dia: Mediterranean Bryophytes**

A. Vanderpoorten: The role of the Mediterranean peninsulas in the Quaternary history of European bryophytes.

J. Kučera & J. Košnar: Hidden diversity in *Pottiaceae*: a story of morphological convergence or taxonomists' ignorance?

16:45-17:15 – Coffee break

C. Sérgio: Bryophytes in selecting Important Plant Areas (IPA) for the Mediterranean region based on a new Portuguese Red-List. Analysis and modelling distribution of species-richness and endangered species.

R. Garilleti & al.: All that glitters is not gold: assessing intercontinental disjunctions in Genus *Orthotrichum*.

M. Puglisi & al.: Analysis of the bryophyte diversity of mountain ranges in Sicily.

18:30 – **Guided visit to the Orto Botanico and Welcome Reception (IAPT sponsored)**

Tuesday, 10 September

9:00 – *Hall A* – **Symposium 3 - F.M. Raimondo: *Taxonomy and floristics in Italy***

S. Pignatti: Rewriting a Flora in the time of Information Technology and Capital driven Science.

G. Domina & al.: 1, 10, 100, how many floristic databases are there in Italy?

L. Cecchi & F. Selvi: From *Alysseae* to *Alyssum* sect. *Odontarrhena* (*Brassicaceae*): a case study for *Flora Critica d'Italia.*

10.45-11.15 – Coffee break

S. Crema & G. Cristofolini: Phylogeny and Endemism Genesis in *Primula* Section *Auricula* Subsection *Euauricula*, a South-European Orophilous Species Group.
G. Astuti & al.: The mysterious case of *Bellevalia webbiana*: which and how many parents for this rare angiosperm species?

9:00 – *Hall B* – **Symposium 4 - A. Crespo & A. R. Burgaz: Lichen studies in the Mediterranean area**
A. R. Burgaz & al.: The Iberian Lichen Flora project. A case of study related with the genus *Cladonia*.
A. Crespo & al.: Cryptic speciation in Mediterranean lichen flora.
10.45-11.15 – Coffee break
H. Mayrhofer & P. O. Bilovitz : Lichenized and lichenicolous fungi of the Balkan Peninsula.
O. Nadyeina & C. Scheidegger: Lichen red-listing on the national and global levels.
C. G. Boluda & al.: Phylogeny of alectorioid lichens (*Parmeliaceae, Lecanoromycetes*) with special emphasis on *Bryoria* sect. *Implexae.*

15:00 – *Hall A* – **Symposium 5 - K. Marhold: *Floristic relationships of Italy with the Balkan Peninsula* (IAPT supported Symposium)**
K. Marhold: Introduction.
B. Frajman & Peter Schönswetter: Facts and fancies about transadriatic connections in plants - phylogenetic evidence.
G. Nieto Feliner: The Mediterranean stage for plant phylogeography. An overview.
16:45-17:15 – Coffee break
N. G. Passlacqua: Phytogeographic analysis of the Southern Apennine mountain flora.
S. Bogdanovic & al.: Phylogeny of the trans-Adriatic *Campanula garganica* complex (*Campanulaceae*).

15:00 – *Hall B* – **Symposium 6 - M. Fennane: *Conservation: legal instruments and their application***
M. Fennane: Présentation du Symposium.
M. Rejdali: Plant conservation from a politician botanist view.
B. de Montmollin: Les différents types de législation sur la protection de la flore et leur mise en œuvre.
16:45-17:15 – Coffee break
S. Lochon-Menseau & al. [J. Molina]: Aires protégées et législation: le cas de la France dans le contexte euro-méditerranéen.
T. Ulian: *Ex situ* plant conservation: Access and Benefit Sharing Agreements under Kew's Millennium Seed Bank Partnership.
S. Brunel: Conservation actions and legal instruments: the case study of invasive alien plants.

Wednesday, 11 September
9:00 – *Herbarium Mediterraneum* – **Poster session.** The posters will be at display throughout the entire conference.
10:45-11:15 – Coffee break

15:00 – *Hall B* – **Symposium 7 - P. Mazzola: *The Mediterranean as source of ornamentals***
A. Santos Guerra: Ornamental flora of the Canary Islands (Macaronesian region).
N. Özhatay & al. [M. Koçyiğit]: Two Important symbols genera for Turkey: *Tulipa* and *Hyacinthus*.
16:45-17:15 – Coffee break
L. Can & Osman Erol: The synopsis of the ornamental genus *Crocus* (*Iridaceae*) in Turkey.

15:00 – *Hall A* – **Symposium 8 - B. Valdés: *The present and future of Mediterranean floristics***
B. Valdés: Introduction, with special reference to the Flora iberica project.
J. El Oualidi, M. Ibn Tattou, M. Fennane: Horizons des recherches floristiques au Maroc.
E. Vela: Etat des lieux et perspectives de recherches sur la flore méditerranéenne d'Algérie et de Tunisie.
16:45-17:15 – Coffee break
G. Kamari: The present and future of the flora of Greece and its conservation assessment.

N. Özhatay: Mediterranean flora and its conservation in Turkey: with special reference to Monocot Geophytes.
O. Vasić: Josif Pančić and the New Flora of Serbia.

19:00 – **Garden Party at the Orto Botanico**

Thursday, 12 September
8:00-22:00 – **Mid-Congress excursion to Mt. Cofano (N.W. Sicily)**
Friday, 13 September
9:00 – *Hall A* – **Symposium 9 - E. von Raab-Straube:** ***Taxonomic data in the information age***
E. von Raab-Straube: Taxonomic data in the information age – state of the art.
P. Wilkin & al.: eMonocot: biodiversity informatics for monocot plants.
D. Mathieu & al.: eFAN: a free electronic database on flora of North Africa.
10:45-11:15 – Coffee break
R. Vignes-Lebbe & al.: Handling descriptive data: Xper^2 and Xper^3.
P. L. Nimis & Stefano Martellos: Digital identification tools: progress and problems.
R. Venanzoni & al.: A web collaborative project to store and map botanical data.

9:00 – *Hall B* – **Symposium 10 - L. Sadori, M. Mariotti, A. M. Mercuri:** ***Palynology for the Mediterranean vegetation history***
L. Sadori & al.: Vegetation history of the Mediterranean region.
A. Bertini & N. Combourieu-Nebout: The origin of the Mediterranean vegetation.
N. Roberts & al.: Pollen records of Holocene vegetation change and the conservation of Mediterranean biodiversity.
10:45-11:15 – Coffee break
K. Kouli: Archaeopalynology of lacustrine records from Greece.
A.M. Mercuri: Present and past pollen rain: aerobiological data applied to palaeoenvironmental reconstructions.

15:00 – *Hall A* – **Symposium 11 - E. Vitek:** ***Collection data in the information age***
S. Knapp: The use of available collection data for taxonomy and systematics.
H. Rainer: Virtual Herbaria - a joint action to present specimens in the web and to connect with other international undertakings (JSTOR, GBIF, Europaeana .....).
16:45-17:15 – Coffee break
G. Le Bras: The mass digitisation effort at the Paris National herbarium: implication and prospects of a new broadly available tool.
E. Vitek: The use of specimen databases for exploration and conservation.

15:00 – *Hall B* – **Symposium 12 - C. Galán Soldevilla:** ***Mediterranean pollen studies***
M. Thibaudon & al.: Medaeronet Website.
R. Albertini & HIALINE working team: Monitoring Networks in Aerobiology, from pollen to allergens.
16:45-17:15 – Coffee break
R. Brandao: Airborne pollen transport in the Mediterranean.
G. Frengueli: Climatic change in the Mediterranean area and pollen monitoring
M. Fornaciari & al.: Airborne pollen as bioindicator of olive crop forecast for the Mediterranean area.

20:00 – **Conference Dinner at the Orto Botanico**

Saturday, 14 September
9:00 – *Hall A* – **Symposium 13 - S. Šiljak-Yakovlev & L. Peruzzi:** ***Progress in Mediterranean karyosystematics and molecular cytogenetics***

G. Bedini & L. Peruzzi: A comparison of plant chromosome number variation among Corsica, Sardinia and Sicily, the three largest Mediterranean Islands.

N. Abdel Samad & al.: Molecular phylogeny and cytogenetic characterization of the Lebanese *Iris* species.

10:45-11:15 – Coffee break

S. Garcia & al.: Polyploidy shaping *Tanacetum*'s diversity in Iran: chromosome number, rDNA organization and genome size.

S. Peccenini & al.: Genome size variation in Italian species of the genus *Erysimum* (*Brassicaceae*).

15:00 – *Hall A* – **Symposium 14 - S. Šiljak-Yakovlev & L. Peruzzi: *Progress in Mediterranean molecular systematics and data bases***

A. Crowl & al. [N. Cellinese]: Evolution and biogeography of the *Campanula drabifolia* species complex in the eastern Mediterranean basin.

S. Tomasello & al.: Inferring species networks from gene trees in polyploid complexes by minimising deep coalescences: examples from the genus *Leucanthemopsis* (*Compositae*, *Anthemideae*).

D. Vitales & al.: Asymmetrical speciation patterns among Mediterranean and Macaronesian *Cheirolophus* (*Asteraceae*).

16:45-17:15 – Coffee break

T. Garnatje & al.: Two cytogenetic databases: Genome size in the *Asteraceae* (GSAD) and Plant rDNA.

M. Bou Dagher-Kharrat, & al.: First steps toward genome size database of the Mediterranean flora.

15:00 – *Hall B* – **Symposium 15 - S. L. Jury: *Mediterranean* Umbelliferae**

S. S. Neves: *Bupleurum* in the Mediterranean: species boundaries and underestimated diversity.

J.-P. Reduron & E. Geoffriau: Recent advances in the *Daucus carota* complex in France.

16:45-17:15 – Coffee break

A. Papini: Phylogenetic relationships of *Careae* and related tribes of *Apiaceae.*

Y. Menemen: An overview of the family *Apiaceae* in Turkey.

Sunday, 15 September

9:00 – *Hall A* – **Symposium 16 - V. H. Heywood: *In-situ conservation of target species***

V. H. Heywood: Introduction: an overview of the issues.

E. Laguna & al. [J. Jiménez]: Plant micro-reserves in the Valencian Region (Spain): Are we achieving the expected results?

G. Rossi & N. Tartaglini: Translocation guidelines for wild flora in Italy from the Italian Ministry of Environment (MATTM).

10:45-11:15 – Coffee break

V. Valdimirov & al.: Plant micro-reserves in Bulgaria: the beginning of the initiative and future perspectives.

15:00 – *Hall A* – **Closing Ceremony and OPTIMA General Meeting**

16:30 – **Farewell drinks (offered by OPTIMA)**

Oral presentations

"Run for your lives!" – has there been a revolution in publishing and communicating botanical results?

Knapp S.[1], Nicolson N.[2], Challis K.[3]

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[2]Biodiversity Informatics, IT Department, Royal Botanic Gardens, Kew, United Kingdom.
[3]IPNI, Herbarium, Library, Art and Archives, Royal Botanic Gardens, Kew, United Kingdom.

In the summer of 2011 at the Nomenclature Section of the International Botanical Congress in Melbourne, Australia, the botanical community made what has been hailed as a momentous decision to allow electronic-only publication of nomenclatural acts – the publication of new names and typifications. Prior to the Congress it was suggested that allowing such a step would open floodgates to what Charles Darwin and Joseph Dalton Hooker disparagingly called "species-mongering" – the description of taxa with little or no thought. But the measure passed by an overwhelming vote in the Section, so it became the reality for those working with algae, fungi and plants worldwide. The zoological community quickly played catch-up, passing their own amendment to the Zoological Code allowing e-publication. Botanists were on the crest of a wave. So, today, two years on from that decision, we take stock of what these changes have meant. Have the floodgates opened to species-mongering? Are species being described and assessed more quickly? Have these changes opened up publication to a wider community? Has the community, both botanists and publishers, embraced these changes with ease and alacrity? We will use data from the International Plant Names Index to explore some of the trends emerging in the first year since electronic publication has been adopted. We will use a few case studies to illustrate some of the problems faced by both scientists and publishers, and will finally will outline some recommendations for interaction in the electronic environment that could help future generations who will use taxonomic work published today. Has there been a revolution? You decide!

New frontiers in Plant Systematics*

MARHOLD K.

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International Association for Plant Taxonomy (IAPT) was founded in 1950 to carry out projects of interest and concern to systematic botanists which require or profit from international cooperation. The Association is dedicated to organismal biodiversity, the extent, recognition, organisation, evolution, and naming of plants and fungi, both living and fossil. To those wishing to be at the forefront of these issues, membership in IAPT will be rewarding. The IAPT maintains the International Bureau for Plant Taxonomy and Nomenclature, and engages in a wide range of activities consistent with its focus. As part of its mission, "to promote all aspects of botanical systematics and its significance to the understanding and value of biodiversity", IAPT presents here the symposium aim of which is to reflect recent developments in areas that are important for the future of plant systematics. Botanical Monographs are the cornerstones for systematic botany. They contain basic statements of relationships among plant species, document vegetative and reproductive structures, modes of reproduction, distributions, ecology, biogeography, and evolution, along with clarification of correct names and affinities with related taxa. That is why one contribution in the symposium is devoted to such publications. Recent changes of the rules governing plant nomenclature encouraged us to present various nomenclature concepts that were discussed over the last decades and suggest some ideas for future. Introduction of molecular methods completely changed the life of plant systematists. New methods and approaches in inferring species trees and networks from molecular data are therefore the topic of the next talk. As an example of a thorough biogeographic analysis, that one of the Pacific islands will be presented. It will show how to find common biogeographic patterns using both molecular and morphological data.

*** IAPT supported Symposium**

Evolution Of Life In Pacific Oceania: A Biogeographic Analysis

Funk V. A.

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Composed of a vast sea with 25,000 islands and reefs, the diverse Pacific realm occupies a third of the planet and holds a crucial place in the Earth's history and resources. Pacific waters nurture two-thirds of the world's marine biodiversity and the islands are rich in endemic plants and animals. Pacific islands are often considered microcosms that can be analyzed in depth and used to predict the behavior of more complex continental ecosystems. There is an effort underway to coordinate research results and ask questions such as: How have physical, ecological and evolutionary processes interacted to form Pacific island ecosystems and their native biota? Part of that effort seeks to find common biogeographic patterns created by using molecular phylogenies in conjunction with morphological data and distribution. The results of recent research studies (from plants, birds and invertebrates) focus on a variety of topics, including some that determine the areas of origin of island biota, test hypotheses of dispersal, examine non-radiating taxa and fossil history, and ask interesting evolutionary questions about rapid speciation, loss of dispersability, adaptive radiations, convergent evolution, modes of speciation, ages of biota and the impact of extinction. In particular the flowering plant family *Compositae* provides a useful example of ongoing studies. This synthesis of recent research demonstrates the power of biogeographic patterns to help us understand the evolution of life in the Pacific.

What is the future for biological nomenclature?

Turland N.

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In 2011, the 18th International Botanical Congress in Melbourne approved major changes to the *International Code of Botanical Nomenclature*, one being to change the title to the I*nternational Code of Nomenclature for algae, fungi, and plants* so as to reflect that it governs the naming not only of plants but of fungi and algae too. Changes to the content included new rules allowing electronic publication, mandatory registration of fungal names, a mechanism for establishing special lists of conserved or rejected fungal names, the abandonment of dual nomenclature for pleomorphic fungi, the abandonment of morphotaxa in fossils, a deep restructuring of the chapter on valid publication, and the option of using English instead of Latin for the validating description or diagnosis of a new taxon.

I now ask a question: does the *Melbourne Code*, with all these new features, adequately serve its users today? Does the *Code* still function to minimize ambiguity in naming, thereby enabling scientists to communicate effectively about the organisms they study? Or has the *Code* become so complex that it presents an impediment to systematics? Could it be simplified, and should it better serve a broader user-group than botanists, mycologists, and phycologists and be more compatible with the naming of clades? Various concepts have been discussed over the last few decades: mandatory registration of names; lists of protected names (Names in Current Use, NCU); a new nomenclatural starting point, as was adopted for names of bacteria; unified bionomenclature (the *BioCode*); and clade-based (phylogenetic) rather than rank-based ("Linnaean") nomenclature (the *PhyloCode*). This presentation briefly examines these ideas, looking ahead to the Shenzhen Congress, the next opportunity to change the *Code*, now only four years away.

Botanical monography – where to go for future?

MARHOLD K.

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Monographs provide the cornerstones for systematic botany. These significant publications contain the basic statements of relationships among organisms, often focused at the specific level. To articulate this goal requires documenting vegetative and reproductive structures, modes of reproduction, distributions, ecology, biogeography, and evolution, along with clarification of correct names and affinities with related taxa (i.e., proposing a predictive classification). Armed with this information, valuable studies on evolutionary biology, floristics, and conservation can be completed. Despite their importance, fewer monographs are now being prepared by the newer generation of systematic botanists, who are understandably involved principally with DNA data and analysis, especially for answering phylogenetic, biogeographic, and population genetic questions. As monographs provide hypotheses regarding species boundaries and plant relationships, new insights in many plant groups are urgently needed. Increasing pressures on biodiversity, especially in tropical and developing regions of the world, emphasize this point. Rather than advocating abbreviated models for monographic products, a full presentation of relevant information is recommended. Electronic publication offers numerous means of illustration of taxa, habitats, characters, and statistical and phylogenetic analyses, which previously would have been prohibitively costly. Open Access and semantically enhanced linked electronic publications provide instant access to content from anywhere in the world, and at the same time link this content to all underlying data and digital resources used in the work. Resources in support of monography, especially databases and widely and easily accessible digital literature and specimens, are now more powerful than ever before, but interfacing and interoperability of databases are much needed. Priorities for new resources to be developed include an index of type collections and an online global chromosome database. Funding for sabbaticals for monographers to work uninterrupted on major projects is strongly encouraged. It is recommended that doctoral students be assigned smaller genera, or natural portions of larger ones (subgenera, sections, etc.), to gain the necessary expertise for producing a monograph, including training in a broad array of data collection (e.g., morphology, anatomy, palynology, cytogenetics, DNA techniques, ecology, biogeography), data analysis (e.g., statistics, phylogenetics, models), and nomenclature. Training programs, supported by institutes, associations, and agencies, provide means for passing on procedures and perspectives of challenging botanical monography to the next generation of young systematists.

Next generation phylogenetics – Inferring species trees and networks from gene trees

Oberprieler C.[1], Wagner F.[1], Konowalik K.[1], Tomasello S.[1], Vogt R.[2]

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[2]Botanic Garden and Botanical Museum Berlin-Dahlem, Freie Universität Berlin, Berlin, Germany.

In order to accomplish the ultimate goal of phylogenetics, being the reconstruction of the evolutionary history of the different lineages of organisms (the ´Tree of Life´), the usage of methods of molecular systematics have developed into indispensable tools of systematists. However, growing evidence for the importance of reticulation events among lineages by processes like hybridisation, homoploid or polyploid hybrid speciation in addition to the classically reconstructed bifurcations renders our gene-tree reconstructions to be only a step on the path towards the long-standing conceptual goal of systematics, being rather a tree of species than a tree of genes. In addition, the advent of large multi-locus datasets (phylogenomics) with their large numbers of independently segregating and individually evolving loci will also necessitate the application of new algorithms for estimating species trees from a number of often contradictory gene trees. The present contribution aims at an account of methods currently used in approaches to estimating species trees from multi-locus fingerprinting and sequence data and will present results for species network reconstructions in polyploid complexes of the *Compositae-Anthemideae* (*Leucanthemum*, *Leucanthemopsis*).

Biodiversity and Conservation of the Mediterranean Bryophytes

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Six years after the previous OPTIMA Bryophyte Symposium, held in Pisa 2007, the Mediterranean bryological scientific community has a new opportunity in Palermo, 2013 to share the latest results of the research activities and make an analysis of the most interesting advances related to various areas of bryology.

The interest in Mediterranean Bryology has grown during the last years especially within the European researchers, but also in African and Asian Mediterranean countries and even all over the world. The fact that information about the Mediterranean bryophyte flora is more accessible due to the publication of the Hepatics, Anthocerotes and Mosses checklists (Ros & al. 2007. Cryptogamie, Bryologie 28: 351-437; Ros & al. 2013. Cryptogamie, Bryologie 34: 99-437) has probably helped. Many research groups from several countries are at present working in this area in several topics related to bryophyte diversity, ecology, origin of the flora from particular areas, conservation, red books, etc. An analysis of some important contributions will be done with the aim to determine the lines in which research should be emphasize in the next years.

The role of the Mediterranean peninsulas in the Quaternary history of European bryophytes

VANDERPOORTEN A.

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Employing a combined approach of species distribution modelling and molecular phylogeography in European mosses, we explore the significance of the Mediterranean refugia, contrasting the southern and northern refugia hypotheses, determine the extent to which recolonization of previously glaciated areas has been facilitated by the high dispersal ability of the species and make predictions on the extent to which it will be impacted by ongoing climate change. The Mediterranean areas exhibit the highest nucleotidic diversities and host a mixture of ancestral, endemic and more recently derived haplotypes. Extra-Mediterranean areas exhibit low genetic diversities and Euro-Siberian populations display a significant signal of expansion that is identified to be of Euro-Siberian origin, pointing to the northern refugia hypothesis. The SDMs predict a global net increase in range size owing to ongoing climate change, but substantial range reductions in southern areas. Presence of a significant phylogeographical signal at different spatial scales suggests, however, that dispersal limitations might constitute, as opposed to the traditional view of spore-producing plants as efficient dispersers, a constraint for migration. This casts doubts about the ability of the species to face the massive extinctions predicted in the southern areas, threatening their status of reservoir of genetic diversity.

Hidden diversity in *Pottiaceae*: a story of morphological convergence or taxonomists' ignorance?

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Identification of taxa in the moss family *Pottiaceae* is notoriously difficult for most bryologists. Being one of the largest moss families with more than 1400 species estimated, the members of the group particularly thrive in the harsh, arid subtropical climates on base-rich substrates. The Mediterranean region is therefore particularly rich in species, with 95% of the nearly 250 species occurring in Europe and Mediterranean together.

Members of *Pottiaceae* are typically minute and the number of available morphological characters on both gametophyte and sporophyte is relatively small. Most of these characters are moreover variable and easily modifiable by environment, which led to prolific description of new taxa based on subtle morphological differences in earlier times. After the extent of phenotypic plasticity has been better understood, attempts at significant reduction of species numbers occurred in revisionary treatments. Nevertheless, filtering out the phenotypic plasticity is methodically difficult, as this kind of variation commonly exceeds the typical interspecific diagnostic differences, and the cultivation experiments are hardly feasible for most *Pottiaceae*. Poor separation of genetically controlled differences from site-conditioned phenotypic expressions in pre-molecular treatments generally overestimated the role of 'transitional morphology' and led to unjustified lumping of species, particularly among the most reduced groups, such as the genera *Gymnostomum*, or *Hymenostylium*. Blurred morphological and phylogenetic boundaries among the traditionally recognized taxa have on the other hand recently been observed in the polyploid complex of *Tortula muralis* s.l. following the hybridization.

Another reason for overlooking a part of the diversity in *Pottiaceae* is their rareness and occurrence in hardly accessible regions. This applies both to the under-explored Mediterranean region and, e.g., the higher locations of the Alps, as was recently demonstrated in the genera *Oxystegus* and *Hymenostylium*.

The most challenging hidden diversity seems, however, to dwell within the superficially well-known and unproblematic taxa. Molecular methods of phylogenetic reconstruction have identified polyphyletic assemblages not only within traditionally recognized genera, but also at the specific level. These 'cryptic species' however usually do differ in characters, which can be morphologically or anatomically described and also possess distinct distributional and ecological patterns. We have thus recently shuffled e.g. the understanding of the *Hydrogonium orientale* group, and extreme cases of morphological convergence can be demonstrated to occur within several traditionally recognized *Didymodon* species. It is therefore absolutely necessary not to limit oneself to inherited taxonomic grails but always look for, integrate and newly interpret the relevant information from all available sources.

Bryophytes in selecting Important Plant Areas (IPA) for the Mediterranean region based on a new Portuguese Red-List. Analysis and modelling distribution of species-richness and endangered species

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Portugal has been the subject of numerous recent bryological studies in important regions although there remain some unstudied areas. From recent fieldwork, 2 new species to science were found and 57 species are reported as new to this country in the last 10 years. We here present an outline of current knowledge using recent and past data records (herbaria and bibliography) as a basis for a new Red List. Using this data Important Plant Areas (IPAs) were selected. Some regions are exceptionally rich in bryophytes as shown in current species richness distribution maps. The IPAs mapped, as well as analysis and modelling of species-richness and important species, can be useful in guiding conservation planning.

Future studies in relatively unknown areas will most likely lead to the discovery of further bryophytes of conservation importance and the benefits of a large-scale joint effort to develop a common model formulation for some species of the Mediterranean region are clearly illustrated.

Analysis of the bryophyte diversity of mountain ranges in Sicily

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The focus of this study is on the bryophytes of the Sicilian mountains in consideration of the interest of the scientific community towards the Mediterranean mountain systems as keepers of outstanding biodiversity and of the initiatives of the IUCN World Conservation Congress (2004) for their biodiversity preservation and enhancement. In particular, we report the results of an analysis regarding the bryophyte diversity of the three mountain chains of the northern Sicily, also called the "Sicilian Apennines", i.e. the Peloritani, Nebrodi and Madonie, as well as of the Sicani mountains, located in the west-central Sicily and of the Etna, the highest and most active volcano of Europe. The overall bryoflora consists of 504 taxa, 400 mosses and 104 liverworts and hornworts, the 85,3% of the whole Sicilian flora; the mosses are referred to 37 families, the liverworts together with hornworts to 31 families.

The phytogeographical analysis has shown the prevalence of the Mediterranean species, with the highest value on the Sicani, the driest mountains. It is to emphasize the occurrence of a set of arctic-montane, and boreo-arctic-montane species, prevailing on the Etna where *Bartramia ithyphylla* and *Pohlia cruda* reach the record altitude of 2,500 m a.s.l. Among this set we quote some noteworthy species, such as *Barbilophozia hatcheri*, *Brachytheciastrum collinum*, *Brachythecium cirrosum, Grimmia alpestris, G. fuscolutea, G. donniana, G. torquata, Hypnum procerrimum, Jungermannia sphaerocarpa, Nardia geoscyphus, Tortula hoppeana*; for these species the Sicilian mountains offer a refuge for their survival.

The relationships of similarity among the moss floras of mountain systems reflects their geographical location and geological features, while the similarity of the hepatic floras, always lower than 50%, mostly reflects the different degree of edaphic and atmospheric humidity.

As regards the bryophyte vegetation, 56 syntaxa (associations and subassociations) are reported from the Sicilian mountains; the communities of the alliances *Racomitrion acicularis, Distichion capillacei, Pohlion crudae* and *Andreaeion petrophilae* are the most chorologically interesting. The greatest number of communities occurs at altitudes between 800 and 1,600 m a.s.l. with higher values between 1,000 and 1,200 meters. Above 1,600 meters the community richness decreases, remaining high only on the Etna up to 1,800 meters.

The analysis of the altitudinal distribution of the taxa and syntaxa shows that the richness of the flora and vegetation increases with altitude and then decreases outlining a parabolic curve with the concavity downwards.

Taxonomy and floristics in Italy

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Taxonomic studies on the vascular flora in recent years have determined a renewal of interest in Italy. This promotion has mainly been caused by the restart of two important editorial projects. The former, about to be concluded, is the second edition of "Flora d'Italia" by S. Pignatti; the latter corcerns the publication of a new "Flora critica d'Italia" which, conceived by the Società Botanica Italiana, will be realized by the Fondazione per la Flora Italiana, which has been purposely established in 2007 within the same SBI. The relevant studies carried out with a modern metodological approach, deal with both problems concerning doubtful or indefinite taxa and the revision of taxonomically complex groups, leading to clarifying results. In the same time they contribute to more deeply survey the phytotaxonomic exploration of the Italian country. The contributions included in this symposium mostly fall within the two works in question. "Rewriting a Flora in the time of Information Technology and Capital driven Science" by S. Pignatti, concerns the former, i.e. his "Flora d'Italia". The other 4 contributions are devoted to the latter and more complex project, that just now takes its first steps. In particular, G. Domina & al. will treat a crucial theme on the informative updated sources regarding la flora of a large territory "1, 10, 100, how many floristic databases are there in Italy"; L. Cecchi & F. Selvi will describe a question just related to the "Flora Critica d'Italia" project: "From *Alysseae* to *Alyssum* sect. *Odontarrhena* (*Brassicaceae*): a case study for Flora Critica d'Italia; S. Crema & G. Cristofolini will present the results of their research on the topic "Phylogeny and Endemism Genesis in *Primula* Section *Auricula* Subsection *Euauricula*, a South-European Orophilous Species Group"; finally, G. Astuti & al. will explain "The mysterious case of *Bellevalia webbiana*: which and how many parents for this rare angiosperm species?".

Rewriting a Flora in the time of Information Technology and Capital driven Science

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My *Flora of Italy*, published in 1982, can be considered among the very earliest fruits of *Flora Europaea*, at least for the families included in Vols. 1-2, whereas the groups published in Vol. 3 of the *Flora of Italy* (*Asteraceae* and *Monocots*) were in proof when the corresponding groups were published in *Flora Europaea*. Now I am near to complete the second edition of the *Flora of Italy*, but this is not a mere update of the previous edition.

The total number of the species indicated for Italy has increased from 5600 in 1982 to 7100: this means a growth of 27 % in 30 years! This growth depends only in some instances from the discovery of new species of vascular plants (e.g. *Zelkova sicula*). In fact the total has increased mainly in consequence of the accurate analysis of some variable groups, larger criteria in the inclusion of alien species, and a prevailing tendency to splitting in the evaluation of the taxonomic rank at the infraspecific level. With similar methods, comparable results would be obtained also for the floras of other countries of Europe and the Mediterranean basin.

The most significant difference in the basic concepts of the *Flora* after 30 years is the transition from the traditional taxonomy to the phylogenetic systematics. In the traditional view a species was considered as a unique combination of characters which can be transmitted to the following generations (mainly morphological characters, at least in plants): such characters can be verified (or falsified) by every student and even by the readers of the *Flora*. Now the most significant taxa (order, family, genus, species) are based on the molecular sequences or on the occurrence of particular chemical components; this information is obtained through sophisticated methods of analysis, which reflect the transition from data to metadata. As a consequence, it is at the moment impossible to give morphological definitions in some groups, such as the former *Liliaceae*, *Scrophulariaceae*, *Senecio* s.l., and *Peucedanum*. This is not a criticism to phylogenetic systematics, which can be regarded as an essential progress in knowledge, but reflects the fact that we are confronted with a scientific revolution in the sense of T. Kuhn and the emergence of a new paradigm. New ideas are necessary for the progress of science. Indeed, the difficult task remains to make these ideas comprehensible for the reader.

What in older times was called "speciography" is presently founded on a different basis. The careful observation of nature, mostly carried out by an isolate student, is now substituted by team work. The results are published in articles with many authors and also the authorship is divided: the problem arises, if it is reasonable that a species may have 4 or 5 authors. For publication, ISI journals are preferred, if possible journals with high IF. A very limited number of publishers control the international dissemination of scientific information and dictate the rules for effective publishing (referees, date, language, length of papers, topics). IF is a powerful factor to focus the research on arguments of particular (direct or indirect) economic interest: papers on medical subjects have an average higher IF than papers in mathematics (although the latter remains the basis of the scientific culture). It is well known that economic interests often have had some influence in academic life, but presently the possibility exists that, in the future, science will be increasingly driven by the global financial system.

For these reasons, the text of the *Flora* does not consist in the bare morphological description of species, but it includes also auto- and synecology, as well as basic information on reproduction: this is an ambitious attempt not to consider species as combinations of characters, but as complex systems interacting in the diversity of the biosphere.

1, 10, 100, how many floristic databases are there in Italy?

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During the last workshop on management and mapping floristic and herbaria data by the Group for Floristics of the Italian Botanical Society (SBI) organized by Floristic Research Center of the Apennine (Gran Sasso-Laga National Park – University of Camerino) held in November 2012 in Barisciano (l'Aquila), the need for a survey on the floristic databases available in Italy emerged. In order to fulfil this purpose the Group prepared a questionnaire to be distributed among all those concerned. It included 36 questions about: type, structure, dimension, property, accessibility, present state and future developments of the Floristic databases. On the whole about three dozens feedbacks were collected and analysed.

There are chiefly two kinds of databases, institutional and personal. In both cases literature or original published or unpublished data are included. In addition, these databases are primarily floristic, while in some cases have been organized for other purposes and include also floristic data (karyological, ethnobotanical, seedbanks, etc.)

It emerged that the great majority of these data are accessible only by the owners and each scholar with his own system of data input and storage without the definition of a standard protocol.

We asked ourselves if we are really interested in sharing our data with the others and how this can be done. The not obvious answer to the first question was: yes, we want to share our knowledge. Two solutions would be technically feasible: a centralized system allowing everyone to input data, or a system showing the data hosted in different DBs systems using matching software capable of mapping and joining different fields (on the model of e-floras).

The latter solution is probably to be preferred, considering the individualistic attitude of many researches and their strong preference for their own systems of data-storage.

Taking into account the large ongoing projects on the Italian flora, the time is right for setting up a tool to make the data that up to now moved only from our drawers to our computers available. Suitable funding will be looked for, but this is not an unbreakable restriction for a scientific community accustomed to committing itself to the challenge of doing.

From *Alysseae* to *Alyssum* Sect. *Odontarrhena* (*Brassicaceae*): A case study for *Flora Critica d'italia*

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This study presents the current knowledge and the still open questions on the systematics of *Alysseae* and *Alyssum* sect. *Odontarrhena*, with special emphasis on the taxa of the Italian flora to be included in the treatment for *Flora Critica d'Italia*.

Circumscription of *Alysseae* and several generic units traditionally included has long been unclear due to the incidence of homoplasious characters and the difficulty to obtain a comprehensive taxonomic-geographic sampling for systematic analyses (Warwick & al. 2008. Botany 86: 315-336). Based on recent evidence, the tribe includes 14 monophyletic genera and ca. 250 species in the Palearctic, especially diversified in the Mediterranean and Irano-Turanian regions. The Italian *Alysseae* belong to eight genera, whose circumscription and affinites have been recently elucidated using molecular phylogenetic analyses. These have led to the exclusion of genus *Ptilotricum* and the reappraisal of the neglected genus *Phyllolepidum* to accommodate a small, monophyletic group of two species from the Apennines, Balkans and Turkey formerly included in *Ptilotrichum* (Cecchi 2011. Pl. Biosyst. 145: 818-831). In fact, the type species of the latter genus, *P. canescens* is a member of tribe *Arabideae* and has no affinity to *Alysseae*.

At a lower level, we focused on *Alyssum* sect. *Odontarrhena*, one of the most diverse lineages of nickel-hyperaccumulator angiosperms in the Euro-Mediterranean region. In the Ligurian-Tyrrhenian area and western Alps, this critical group includes three serpentinicolous endemic taxa, *A. robertianum*, *A. bertolonii* and *A. argenteum*. At least two other species, *A. nebrodense* in Sicily and *A. alpestre* in the western Alps grow on limestone or dolomite, as well as Sardinian populations currently included in *A. robertianum*. However, the taxonomic limits, distribution and affinities between these and other taxa of the southern Europaean flora remain unclear. Using morphometric, karyological and molecular methods (Cecchi & al. 2010. Ann. Bot. 106: 751-767; Cecchi & al. 2013. Bot. J. Linn. Soc., in press), evidence was obtained that sect. *Odontarrhena* should be treated as an independent genus (*Odontarrhena* C.A.Mey.), including three clades without internal geographic cohesion. Tetraploid *A. argenteum* is nested in the clade of the continental and mainly Balkan group of *A. murale* along with diploid *A. robertianum* s.str. from Corsica, while the Tuscan, mainly diploid populations of *A. bertolonii* belong to a a distinct, more Mediterranean clade together with the tetraploid plants from Sardinia. These belong to the separate species, *A. tavolarae*. Evidence was also obtained that the serpentinicolous populations from the northern Apennines currently included in *A. bertolonii* are tetraploid and clearly closer to alpine *A. argenteum*.

Phylogeny and Endemism Genesis in *Primula* Section *Auricula* Subsection *Euauricula*, a South-European Orophilous Species Group

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The species of *Primula* L. Sect. *Auricula* Duby Subsect. *Euauricula* Pax are mainly distributed on the Italian Alps and on the Apennines, with a very high rate of endemism: 16 species are currently recognized, 7 of which are narrow endemic, restricted to very small areas, 4 are endemic to various sectors of Southern Alps, and just 5 have a wider distribution on South European mountain ranges.

We performed a phylogenetic study employing AFLP (*Amplified fragment length polymorphisms*) markers on 261 samples collected in the wild from 33 populations, covering all species. AFLP proved to be a molecular marker with a high resolution power, better than e.g. ITS (*Internal Transcribed Spacers*).

The main results were: (a) Subsect. *Euauricula* constitutes a monophylum; (b) a polytomy is at the base of the cladogram, suggesting an event of simultaneous multiple speciation; (c) *P. palinuri* Petagna, the only species of Mediterranean coastal habitats, diverged very early from the rest of the subsection, and seems not to be related to any other extant species; (d) populations of *P. auricula* L. incl. *P. balbisii* Lehm. are intermixed to form a well supported clade, sister to the rest of the subsection; (e) the calcifuge species form a clade of recent origin: among them, a well supported clade includes *P. pedemontana* Thomas, *P. cottia* Widmer and *P. apennina* Widmer; *P. cottia* is not related to *P. villosa* Wulfen, with which it has been often confused; (f) *P. hirsuta* All. forms a clade with the calcicole endemics *P. valcuvianensis* (S. Jess. & L.Lehm.) Cristof. & Crema and *P. grignensis* Moser, which, in their turn, form a separate sub-clade; (g) *P. albenensis* Banfi & Ferlinghetti and *P. recubariensis* Prosser & Scortegagna form a well supported clade. A preliminary dating of the speciation events has been also attempted.

Main conclusions were: (a) The basic polytomy may be accounted for by simultaneous fragmentation of the distribution range during the Pleistocene. (b) The pattern of diversity and distribution of the Alpine and North-Apenninic endemic species can be hardly explained by the hypothesis of survival in refuge areas: a more likely explanation is that the parental species experimented range expansion at low altitudes during the cold periods, and range contraction toward the mountains' top during the warm phases, with consequent fragmentation and genetic isolation. (c) *P. palinuri* is seemingly the only endemic species in this group with relictual character.

The mysterious case of *Bellevalia webbiana*: which and how many parents for this rare angiosperm species?

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Polyploidy is widespread in plants, affecting genomic and chromosomal arrangement, driving speciation and evolution. One of the most intriguing speciation events involving polyploidy is certainly the one originating *Bellevalia webbiana*, a bulbous monocotyledonous herb, endemic to Central Italy. This species is tetraploid ($2n = 4x = 16$ chromosomes), and its origin has long been debated since its description in 1854. First, many authors considered it as just a F1 hybrid between *Muscari comosum* and *Bellevalia romana*, but this was later definitely confuted. *B. webbiana* behaves as a diploid at meiosis, seemingly pointing to allopolyploidy. More recent hypotheses, based on the assumption of allopolyploid origin, involve other diploid *Bellevalia* as putative parents: 1) an origin *B. boissieri* × *B. romana*, on the basis of the nucleoli number or 2) *B. romana* × *B. trifoliata*, on the basis of the co-occurrence of the two species in the historical sites of *B. webbiana*. Cytogenetic and molecular analyses were conducted to shed light on this mystery. Molecular markers, nuclear and plastidial, were used to reconstruct the phylogeny of the Italian *Bellevalia* species, thus allowing the detection of the putative diploid parental species eventually related to *B. webbiana*. These species were subsequently used for GISH (Genomic In Situ Hybridization) analysis. Also FISH analysis was performed on *B. webbiana* chromosomes, targeted on 45s and 5s rDNA loci. According to our results, *B. romana* does not appear a good candidate as one of the species originating *B. webbiana*. Instead, *B. webbiana* is closely related to *B. ciliata* and *B. trifoliata* on morphological grounds, and to *B. boissieri* based on karyological data. The relationship with *B. boissieri*, *B. ciliata* and *B. trifoliata* is confirmed by molecular ITS data, which furthermore supports an allopolyploid origin, possibly involving all the three above cited taxa. Within its range, B. webbiana can occur together with *B. romana* and/or *B. trifoliata*, but also *B. ciliata* is found in a single population not very far. On the other hand, *B. boissieri* is presently known only for extreme southern Italy. Interestingly, *B. trifoliata* is closely related to *B. webbiana* for ITS sequences but quite distant for plastidial *trn*L-*trn*F IGS sequences, thus seemingly excluding this species as a "ovule donor". Preliminary GISH results further evidenced diffuse genome similarities among *B. webbiana* and its three putative parents. Comparing the chromosomal localization of the rDNA loci, further evolutionary hypotheses were developed, involving some chromosomal and genomic rearrangements.

The Iberian Lichen Flora project. A case of study related with the genus *Cladonia*

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The Iberian Lichen Flora project started in 1990 was sponsored by the Spanish Lichen Society (SEL) and supported by the Spanish public authorities with the objective of knowing and revising most of the species that grow in Spain and Portugal. The Iberian Lichen Checklist included 2426 lichens and 368 lichenicolous fungi. Nevertheless many problems arose due to several areas and habitats unexplored. The Iberian Peninsula is quite diverse in substrates, altitudes and vascular vegetation, and few lichen specimens were available into the national herbaria. At the same time a decrease of lichen diversity was observed in relation with the increase of chemical pollutants or forest management.

The Iberian Peninsula constitutes the western and southern biogeographical limits for many Euro-Asiatic species. The main mountains ranges are difficult habitats to be colonized by some lichen species. In other cases they are important isolated refuges.

We are still far from understanding the ecology and distribution of the Iberian lichens. This knowledge is important in conservation biology because: (1) they establish a baseline for species identification and thus the necessary framework for ecological studies, (2) they provide biogeographical context to better understanding how the species are distributed, which of them are rare and restricted, or which are frequent and widely distributed.

Ten volumes have been published from 2003-2011 which comprises nearly 500 species related with several lichen groups. *Peltigerales*: *Lobariaceae*, *Nephromataceae*, *Peltigeraceae*, *Massalongiaceae* and *Placynthiaceae*. *Graphidaceae*, *Solorinellaceae*, *Gyalectaceae*. *Bacidiaceae* I. *Cladoniaceae*. *Physciaceae* I. *Pannariaceae*. Calicioid. Lichenicolous *Agaricales*: *Hygrophoraceae* (*Arrhenia* and *Lichenomphalia*); *Cantharellales*: *Clavulinaceae* (*Multiclavula*) and *Hydnaceae* (*Burgoa*). *Collema*.

Moreover, in the framework of Iberian Lichen Flora project when there are a broad knowledge of one lichen group and exist good collections it is possible to develop new studies in lichen taxonomy based on combinations of phenotypic and DNA sequence data. This was the case of the genus *Cladonia* which comprises nearly 500 species (85 in the Iberian Peninsula) worldwide distributed. They are conspicuous element of many regions although easily recognized at genus level, the morphology and chemical variability is poorly understood in several cases. This high morphological variability in the genus *Cladonia* is probably an effect of the phenotypical plasticity induced by factors such as exposure to light, temperature or humidity.

We resolved many taxonomic problems related with the morphological boundaries as *C. convoluta* vs. *C. foliacea, C. subulata* vs. *C. rei, C. coniocraea* vs. *C. ochrochlora, C. subturgida* vs. *C. iberica, C. humilis* group, *C. cariosa* group or *C. gracilis* group. Other groups are in study such as *C. mediterranea* or *C. furcata*.

Cryptic speciation in Mediterranean lichens

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Most lichenized species have traditionally been recognized based on morphological and chemical characters. Within *Parmeliaceae*, the largest family of lichen-forming fungi, several species have now been studied in depth using phylogenetic molecular approaches. Some are widely distributed in the Mediterranean region of Europe, having either continuous (some of them sub-cosmopolitan) or disjunct areas reaching western North America. Cryptic species have been detected in both kinds of biogeographic patterns.

We present here a review of different cases of cryptic species in the genera *Parmelia*, *Parmelina*, *Melanelixia* and *Melanohalea*. In several cases disjunct subareas show different but cryptic species in both continents. In species with continuous areas, cryptic species have been also recognized but geographical patterns generally remain unclear.

Cryptic speciation can involve monophyletic sibling species (i.e. cryptic species s. str.) but most frequently they prove to be poly- or paraphyletic lineages which are morphologically close and in some instances almost or not distinguishable. Such cases pose problematic issues in the development of conservation policies, and also when producing regional accounts and inventories.

Studies involving what have generally been considered widely distributed lichen-forming species have revealed that some of the most familiar "species", are not single species, but rather a reservoir of hitherto unappreciated fungal diversity.

Lichenized and lichenicolous fungi of the Balkan Peninsula

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The present knowledge of the biodiversity of lichenized fungi and especially of the lichenicolous fungi from the Balkan Peninsula is still rather incomplete. During the last twenty years H. Mayrhofer, his students and co-workers intensified lichenological activities by establishing projects with local scientists. Publications started with floristic papers, followed by catalogues based on a thorough evaluation of the floristic and taxonomic literature for Slovenia (2000), Crete (2001), Bulgaria (2005), Montenegro (2009), Bosnia & Herzegovina (2011) and FYROM (2013). Printed checklists by other authors are available for Serbia (2006), Albania (2007) and Greece (2009) and a preliminary online version for Croatia (2010). The catalogues and checklists stimulated other scientists to contribute and to improve the knowledge with several floristic papers. The extensive virgin forest areas (e.g. Biogradska gora in Montenegro and Perućica in Bosnia & Herzegovina) are hot spots of lichen biodiversity. Today Greece (without Crete) has a known lichen diversity of c. 1170 lichen species (Crete c. 670, most of them also known from mainland Greece), Bulgaria c. 1060, Slovenia (including the Southern Alps) c. 1015, Croatia c. 1000, Montenegro 788, Serbia (incl. Kosovo) c. 705, Bosnia & Herzegovina 632, FYROM 592, Thracia c. 400, and Albania, the least known, only 396. Data concerning lichenicolous fungi are only available from Montenegro (38), Bosnia & Herzegovina (17), FYROM (20) and Albania (35).

Lichen red-listing at the national and global levels

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IUCN red lists at global and regional levels have become a scientifically objective and widely accepted instrument for prioritizing species conservation of various groups of organisms. The criteria that enable the assessment of red-list categories can be applied for plants, animals and fungi, including lichens.

National red lists of lichens have now been published in many European and Asian countries but continental and global assessments of lichens are still lacking.

There are three major obstacles that make red-listing of lichens a problem at local as well as at larger geographic levels: incomplete floristic and taxonomic knowledge of taxa, lacking data on population data of species and an often unfathomable reluctance of some funding agencies when it comes to support conservation projects outside the standard pets and petioles. We will discuss two case studies addressing the first two problems.

Cetraria aculeata and *C. steppae* are two closely related species, however, the taxonomic status of the arid taxon *C. steppae* has been questioned, as its morphology varies greatly and its distribution range overlaps with the globally distributed *C. aculeata*. Numerous doubtful records made a national red list assessment of both taxa difficult. Our recent study considered *C. steppae* to be conspecific with *Cetraria aculeata* based on morphology, secondary chemistry and ecology. Based on local population studies, as well as current and historical distribution data, we have recently assessed the national Red List status of *C. aculeata* s. l. in Ukraine according to the IUCN criteria.

Lobaria pulmonaria is a widespread species in Europe and elsewhere in the Northern hemisphere. Although it has declined tremendously in most European countries, Red-listing at a continental or global level was so far difficult because data on historical decline of population size, extent of occurrence and the area of occupancy was incomplete for large parts of the species' distribution area. Recent molecular studies revealed several distinct genepools with different geographic distribution and ecological niche differentiation, which will allow to consider genepools as distinct evolutionarily significant units and thus to evaluate distinct genepools against the Red List criteria.

Phylogeny of alectorioid lichens (*Parmeliaceae*, *Lecanoromycetes*) with special emphasis on *Bryoria* sect. *Implexae*

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The alectorioid lichens form a morphological group in *Parmeliaceae* the phylogenetic relationships of wich are still unclear; the concept we are using here includes *Alectoria*, *Bryocaulon*, *Bryoria*, *Nodobryoria*, *Oropogon*, *Pseudephebe* and *Sulcaria*. The species are fruticose, from erect to pendent and with cylindrical thalli, a hard cortex, and a lax medulla. Most species in the group usually lack sexual structures and morphological variability is scarce. Moreover, in some groups, as in *Bryoria*, species have high intraspecific variability and there are not uncomonly cases where one single specimen shows intermediate characters of several species. We are focusing this investigation in the section *Implexae* of this genus including *Bryoria chalybeiformis, B. capillaris, B. glabra, B. implexa, B. fuscescens, B. lanestris* and *B. subcana*.

In this contribution we present a multigenic phylogenetic reconstruction using ITS, LSU nrDNA, SSU mtDNA, and single copy protein coding gene MCM7 of more than 50 species.

Preliminary results reveal: (a) the alectorioid lichens are split into two independent lineages, (b) the genera are monophyletic, and (c) within Bryoria sect Implexae the most common European taxa are conspecific.

Floristic relationships of Italy with the Balkan Peninsula*

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International Association for Plant Taxonomy (IAPT) founded in 1950 is dedicated to organismal biodiversity, the extent, recognition, organization, evolution, and naming of plants and fungi, both living and fossil. The Association was always active in Europe and particularly in the Mediterranean area, supporting a wide range of plant taxonomists working in this region. This was the main reason while the symposium on the floristic relationships of Italy with the Balkan Peninsula got our full support. Indeed, the Mediterranean belongs to the most important Earth's biodiversity hotspots being shaped particularly by the geological history, climate changes and last, but not least, by the human activities (Thompson, 2005, Plant Evolution in the Mediterranean). Introductory talk by Gonzalo Nieto Feliner provides an overview of the current state of Mediterranean phylogeography and sets the stage for other talks of the symposium. Phylogenetic evidence for the plant transadriatic connections is summarized by Frajman & Schönswetter. While some close relationships of Italian and Balkan plant populations stem from the time when southern Italy and Balkans were connected by a chain of islands across the strait of Otranto, others are result of their spread along the coast. Examples of the taxa where transadriatic relationships were confirmed as well as those where they were rejected are given. The talk by Passalacqua deals with the Southern Apennine mountain flora that is important for better understanding of Italian-Balkan floristic connections. Finally, Bodganović & al. provide an example of analysis of the transadriatic species complex, on the case of Campanula garganica and related species using nuclear and plastid DNA sequences as well as DNA fingerprinting. Revealed genetic structure of this complex clearly indicates connections between Apennine and Balkan Peninsulas in the past, most likely during Pleistocene fluctuations of the sea level.

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Facts and fancies about transadriatic connections in plants - phylogenetic evidence

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Contemporary distributions of plants are result of different factors, such as historic geologic activities and climatic fluctuations, biology of the species (different dispersal modes) as well as recent influences, e.g. through human activities. In general, geographically closer areas share a more similar flora than more distant ones and larger water bodies (e.g. seas, oceans) often present barriers for dispersal. Such a barrier is also the Adriatic Sea, but it has been long acknowledged that several species managed to bridge this barrier, resulting in amphi-Adriatic distribution patterns. Traditionally it is assumed that many of these plants have bridged the Adriatic in the Tertiary (Miocene-Pliocene), when southern Italy was connected with the Balkans by a chain of islands across the Otranto Strait. The other, mostly Illyrian species, have more likely spread along the northern Adriatic coast. Some examples of the species (groups) with amphi-Adriatic distribution are the *Campanula garganica* complex, *Cardamine glauca*, *Drypis spinosa*, *Euphorbia barrelieri*, *Gentianella crispata* and *Potentilla apennina*. Some of them were recently studied phylogenetically and hypotheses of close relationships between populations/species from both areas were either confirmed (as in the case of *C. garganica*) or rejected (as in the case of *Androsace mathildae – A. komovensis*). Other phylogenetic studies indicated some additional connections, as in the case of *Knautia visianii* and *K. lucana*. The timing of the diversification events between the Italian and Balkan Peninsula is difficult to assess, but some studies indicate that the dispersal to Italy has likely taken place at different time horizons and is thus not limited to the Tertiary.

The Mediterrean stage for plant phylogeography. An overview

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The Mediterranean basin is one of the earth's 25 biodiversity hotspots, hosting c. 24,000 plant species of which c. 60 % are endemics. Such a wealth has been attributed to a combination of biotic and abiotic factors such as palaeogeologic and palaeoclimatic history, ecogeographical heterogeneity, human influence, and a complex and dynamic biogeography. Some of these factors are of enough magnitude and extension so as to have provoked common patterns on the phylogeographies of different species sharing similar habitats and areas. Examples of large-scale patterns are east-west phylogeographic breaks no matter if the ultimate specific barriers coincide or if these breaks are associated to current geographic gaps; north-south genetic diversity gradients within lineages resulting from Pleistocene glaciations; east-west species and diversity gradients; etc. Lower scale shared patterns are also found such as phylogeographic breaks resulting from straits and sometimes associated vicariance; coincidence in glacial refugia; etc. Yet, more than two decades after the coining of the term Phylogeography and despite an accumulation of studies under this umbrella in the Mediterranean basin over the last decade, common phylogeographic patterns are scarce compared to areas like the Alps or North America. Because of this scarcity, finding spatio-temporal concordance among genealogical splits across multiple co-distributed species or with dated abiotic events is not only important to improve confidence of phylogeographic results but also to find common patterns in the frame of comparative studies in this region. Also, focusing not just on phylogeographic patterns but also on influential processes seems necessary to acquire an integrated picture of plant evolution in the Mediterranean region over the last two million years. Moving towards this end would also allow insights into the role of the three southern Mediterranean peninsulas in shaping the diversity of this hotspot both at the specific and population levels.

Phytogeographic analysis of the Southern Apennine mountain flora

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Flora of Southern Apennine is not yet well known, so that many phytogeographic questions have to be solved. Even if in the middle of Mediterranean area, these mountains have an attenuation of Mediterranean climate towards a temperate one and a consequently uncertain phytogeographic definition: using flora from the top of the mountains, and after the definition of ecological and geographical elements, many analysis are carried out correlating ecological and geographical factors. The definition of ecological parameters was carried out through the analysis of phytosociological literature, so that 5 macro habitat were defined, while syntaxonomic considerations and the statistical analysis of 600 phytosociologic releves of Southern Apennine mountain plant communities, using site data (altitude, slope, vegetation coverage, and physiognomy) as ecological factors, were used to define 5 ecological elements. For species distribution main taxonomic literature, including available on line floristic databases, were used. Chorotypes were defined following the methodology proposed by Arrigoni (1983), using his choronomic unit pattern with some modification; moreover, a sharing index (Passalacqua 1998) was used to differently analyse the spatial distribution of species.

Results show that altitudinal flora is more similar to the European flora than to the Mediterranean one, and particularly to that of the Balkan peninsula mountains; the affinity with Oro-Mediterranean flora is generally very low, although it grows when analysing habitats where ecological factors increase Mediterranean conditions. At the end of this research we can formulate some phytogeographyc hypotheses: 1) Apennine flora show a great affinity along the mountain chain and the phytogeographic boundary of Southern Apennine is very weak; 2) top mountain flora of the Southern Apennine is clearly European, so that and the boundary between European and Mediterranean flora slide down along the Apennine chain at least to Northern Calabria; 3) we can hypothesize a choronomic area including Balkan peninsula mountains and Apennine chain, which is tied to the Middle-European area and represents a transitional area to the Oro-Mediterranean one.

Phylogeny of the trans-Adriatic *Campanula garganica* complex (*Campanulaceae*)

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The genus *Campanula* L. (*Campanulaceae*) has highest species diversity in the Mediterranean region. One of the morphologically and phylogentically clearly recognized group is the isophyllous group of ten trans-Adriatic endemic taxa. This group is attributed to the *Campanula garganica* complex that taxonomically belongs to the sect. *Campanula* ser. *Garganicae* Trinajstić. This complex exhibits a trans-Adriatic and Ionian distribution with the majority of species distributed along the East Adriatic coast. The taxa belonging to this complex are: *C. reatina* Lucchese, *C. garganica* Ten., *C. fenestrellata* Feer subsp. *fenestrellata*, *C. fenestrellata* subsp. *istriaca* (Feer) Damboldt, *C. portenschlagiana* Roem. & Schult., *C. poscharskyana* Degen, *C. cephallenica* Feer, *C. acarnanica* Damboldt, *C. debarensis* Rech. f., while the sister species to the group is Albanian endemic *C. comosiformis* (Hayek & Janch.) Frajman & Schneew. Here we explore the phylogeny and diversification of the *C. garganica* complex based on, nuclear (ITS) and plastid (trnL-trnF) DNA sequences and AFLPs. Our molecular phylogenetic study confirmed the monophyly of the complex, while the relationships among taxa are poorly resolved. The plastid and nuclear datasets were only partly congruent. A new phylogenetic insight into the *C. garganica* complex revealed the existence of two new species, recently described as *C. teutana* Bogdanović & Brullo from remote central Adriatic island of Vis and *C. skanderbegii* Bogdanović, Brullo, & D. Lakušić from the central Albania. Both species are morphologically similar to central Adriatic species *C. portenschlagiana* but phylogenetically they are not the closest relatives. Broader sampling of the Albanian populations previously attributed to (= *C. garganica* Ten. var. *albanica* Markgr.), revealed the existence of a new hidden taxon based on ITS and cpDNA sequences, and showed close morphological relationship to *C. fenestrellata*. Preliminary analysis of AFLP fingerprinting was performed on 23 populations in order to obtain further insight into phylogenetic relationships within the complex. The AFLP data clearly separated all investigated taxa revealing some new lineages, and indicated the existence of six genetic groups. AFLP data shows hybridisation zones between sympatric *C. fenestrellata* and *C. istriaca* in the Northern Adriatic region, as well as the close relationship between *C. garganica* from Mt. Gargano (Italy) and *C. teutana* from Vis Island (Croatia) Haplotype network detected 24 different haplotypes and supports recent diversification of taxa. Obtained genetic structure of *C. garganica* complex indicate connections between Italian and Balkan Peninsula in the past probably during Pleistocene fluctuations of the sea level. Southern populations are connected to Albanian ones and further detailed phylogeographic analyses are needed to elucidate possible connections, migrations and phylogenetic relationships between newly described Albanian taxa to the rest of *C. garganica* complex.

Botany at the heart of the legislation for the conservation

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The conservation of biodiversity is a global challenge and a big human responsibility to bequeath to future generations a less disturbed natural environment possible.

To achieve this objective, legislative tools become compulsory in order to review, complete and update the existing exploitation rules, to better protect and conserve species and habitats.

The general situation becomes more and more complicated, as economic issues and conflicts of human population interests affected by these actions are often very important.

In the past, botanists devoted their entire time to study plants. They have now other new responsibilities to assume beside lawmakers and biodiversity managers. Their role is essential to ensure that decisions made contribute as best as possible for species preservation and maintain ecological balances.

Actions for biodiversity conservation are practiced at different scales (international, national and local), from different angles (ecosystem approaches or by habitats, by species, genes ...) and often involve many stakeholders (managers or decision makers, users, lawmakers, botanists, NGOs ...). Tasks are difficult and stakes are important. Our contribution in this symposium is a good illustration for these issues.

Plant conservation from a politician botanist view

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Both botanists and politicians agree on the fact that sustainable management of plant resources is basic for their conservation as well as for human welfare and vital for animal and human survival. However, if the botanists tend to be more pure conservationists, politicians seem to oversize the population needs all though preservation concern is always taken into account. Many and special efforts are to be deployed in order to bring closer politicians and scientist views and opinions. Thus the involvement of botanists in politics would have great inputs in promotion of promulgating conservation laws and regulations. It would also help to increase more understanding and raise conviction and awareness amongst politicians and decision makers.

Les différents types de législation sur la protection de la flore et leur mise en œuvre

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Les outils réglementaires à disposition pour la protection et la conservation de la flore sont nombreux et complexes. Cette complexité rend leur mise en œuvre et surtout le contrôle de leur efficacité difficile.

On peut distinguer les catégories suivantes:

1. Législations sur les espèces
   - Traités, conventions et réglementations internationaux qui fixent des objectifs et des contraintes aux Etats signataires (Convention sur la diversité biologique, Stratégie mondiale pour la conservation des plantes, …).
   - Législations nationales ou sous-nationales, comprenant la plupart du temps des listes d'espèces, avec les difficultés liées à la mouvance de la nomenclature et à l'identification par des non-spécialistes.
   - Listes d'espèces menacées ou prioritaires, par exemple la Liste Rouge de l'UICN ou les Listes Rouges nationales ou régionales.
- Listes d'espèces dont le commerce est réglementé ou interdit (CITES).
2. Législations sur les écosystèmes et les habitats
   - Habitats prioritaires ou protégés, à l'exemple de la Directive Habitats de l'Union Européenne.
   - Listes Rouges des écosystèmes.
   - Zone Importantes pour la Biodiversité, à l'exemple des IPA – Important Plant Areas.
3. Législations sur les sites
   - Traités, conventions et réglementation internationaux.
   - Législations nationales ou sous-nationales.
   - Réseaux d'aires protégées, connections entre les écosystèmes (Trame Verte ou Trame Bleue).

En accompagnement de ces textes législatifs, il faut prendre en considérations les politiques d'aménagement du territoire, agricoles ou commerciales, dont les effets sur la conservation des espèces et des habitats peut être importante et dont la cohérence avec les réglementations et les objectifs de conservation de la biodiversité n'est pas toujours assurée. Les Stratégies nationales en matière de biodiversité sont un instrument qui permet d'améliorer la coordination entre les différentes politiques ayant des influences sur la biodiversité.

Aires protégées et législation: le cas de la France

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Les préoccupations actuelles sur la biodiversité font intervenir des notions de patrimonialité, de rareté, d'endémisme et de menaces et s'intéressent à des objets identifiés, espèces comme habitats naturels. Elles héritent aussi de la mise en œuvre d'outils de hiérarchisation des enjeux et de préoccupation à de larges échelles, comme l'Europe, le bassin méditerranéen ou l'ensemble de l'aire d'une espèce.

Différents outils de protections ont émergé au cours du temps pour répondre aux enjeux du moment : dès 1960, création des premiers parcs nationaux pour répondre à un objectif de sanctuarisation de grands massifs exceptionnels, puis suite à la loi de protection de la nature de 1976 création des réserves naturelles, et enfin plus récemment les sites Natura 2000 , répondant à la mise en œuvre des directives européennes oiseaux et habitat. La création d'aires protégées résulte de concertations dans lesquelles interviennent des acteurs de la sphère sociale et qui s'éloignent parfois des objets scientifiques (espèces et habitats naturels) pour lesquels elles sont mises en œuvre. Et la protection ne suffit pas en soi, surtout quand espèces et habitats naturels ont besoin d'être gérés pour être conservés.

Le sujet traitera de l'adéquation des outils de protection des espaces en France face aux enjeux de biodiversité (flore et habitats naturels) actuellement identifiés.

Après un tour d'horizon des différentes protections existantes et une analyse de leurs atouts et limites, nous chercherons à évaluer leur pertinence face aux préoccupations de protection ou de conservation identifiées. Les protections réglementaires sont lourdes à mettre en place et coûteuses, mais pérennes, alors que d'autres protections « contractuelles » sont plus aisées à initier, mais manquent souvent de continuité. En termes de surface, les protections mises en œuvre ne sont pas toujours en adéquation avec les populations d'espèces ou les habitats naturels concernés.

La Stratégie de Création des Aires protégées (SCAP), actuellement initiée par le Ministère de l'Environnement et animée par le Muséum National d'Histoire Naturelle, propose une méthode pour arriver à un objectif de 4% du territoire sous protection forte, en s'appuyant sur des listes d'espèces et d'habitats cibles, et en définissant des niveaux de priorité.

Nous analyserons les listes et identifierons des éléments à améliorer pour arriver à un standard de protection / conservation acceptable et efficace au vu des connaissances actuelles sur la biologie de la conservation.

Ex situ plant conservation: Kew's Millennium Seed Bank partnership and Access and Benefit Sharing Agreements

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Kew's Millennium Seed Bank partnership is the largest *ex situ* plant conservation initiative formed in the world and coordinated by the Seed Conservation Department of the Royal Botanic Gardens, Kew (RBG Kew). It focuses on saving plant life and regions most at risk from climate change and the ever-increasing impact of human activities and plants most useful for the future. Seeds are collected and stored in seed banks in country and are duplicated in Kew's Millennium Seed Bank in the U.K. With a network of over 120 partners across 50 countries, the partnership has already saved 10% of the world's flora and it is aiming to secure 25% of the world's plant species by 2020. Each project partnership is based on an Access and Benefit Sharing Agreement between the RBG Kew and the partner institute and/or government committing to implement the letter and the spirit of the Convention on Biological Diversity. This includes the sovereign rights of States over their own biological resources and the authority of national governments to determine access to genetic resources, subject to national legislation. Prior Informed Consent is obtained from appropriate authorities and stakeholders, according to national legislation, before any seed collections are made and before duplicate seed collections are transferred to the Millennium Seed Bank in the U.K. Examples of project partnerships are given showing how RBG Kew co-operates with other organisations to share fairly and equitably any benefits arising from the collection, study and conservation of wild plant genetic resources, their progeny and derivatives.

Conservation actions and legal instruments: the case study of invasive alien plants

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According to the Convention on Biological Diversity (CBD) and to the International Plant Protection Convention (IPPC), an invasive alien species is 'an alien species that by its establishment or spread has become injurious to plants, or that by risk analysis is shown to be potentially injurious to plants'.

Invasive alien plants represent a huge threat to biological diversity, agriculture and the economy. They may also affect human health, as is the case for the highly allergenic *Ambrosia artemisiifolia*. It is estimated that invasive alien species cost Europe around € 12 billion per year.

Nevertheless, the impacts of invasive alien plants remain poorly addressed. For example, very few countries have legal instruments to tackle invasive alien species, and a legal framework is only now being developed at the European Commission scale. Dealing with invasive alien plants which can either be introduced voluntarily as ornamental plants, or unintentionally as contaminants of commodities (e.g. grain, passengers, machinery) involves complex legal tools to either prohibit the import, trade, planting, or the release into the wild of these plants. This is even more difficult when their impacts remain largely unknown to the general public. The lack of understanding of this topic lies within public institutions as well as the general public, including conservationists and botanists. Addressing the issue of invasive alien species is complex as it involves explaining what an alien species is, what are its impacts, which may not be visible immediately in particular concerning environmental impacts. As a consequence, invasive alien plants often remain unnoticed and unreported in the field. This is particularly true in Mediterranean countries where the level of awareness remains low, while Mediterranean ecosystems are very much at risk from invasive alien species.

Further communication actions on invasive alien plants are therefore greatly needed. To achieve this, priorities include focusing on highly relevant species such as *Solanum elaeagnifolium* which has huge detrimental agricultural impacts, and *Eichhornia crassipes*, an aquatic plant with major negative environmental, agricultural and social impacts. These 'flag' species may enhance the comprehension of the different stakeholders concerning invasive alien plants, and could lead to a more systematic listing and early warning of these species in Mediterranean countries.

The Mediterranean as source of ornamentals

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Cultivation of plants for ornamental purposes throughout the Mediterranean dates back to deep antiquity. In fact Egyptian, Greek, Roman and other previous myths are pervaded with correlations among humans, gods and plants either useful or ornamental – whose names such as hyacinth, narcissus, and many others that are still common. In that period almost all of the ornamental flora was native to the Mediterranean and next countries, having been the flow from other territories irrelevant up to the Renaissance. From XVI century on, the whole Mediterranean ornamental heritage was gradually spread throughout the new discovered territories, and from there a huge number of plants was introduced to Mediterranean and Europe. These floristic exchanges were greatly facilitated by the botanical gardens that, since 1545 (Padua) put into cultivation and spread plants everywhere in the world. In regards to geographical features, the whole area is of remarkable interest, but within it there many countries from where a greater number of ornamentals was selected: in the eastern Mediterranean border, Turkey was the source of the *Tulipa* germplasm and other geophytes introduced in Italy and the Netherlands, when modern floriculture started. As for the Mediterranean progenitors of ornamentals as *Scilla peruviana* from Southern Spain, *Lathyrus odoratus* from Sicily and Southern Italy, and many other local endemics frequently belong to floristically rich regions. Another area biogeographically very close to the Mediterranean is the Canary Islands archipelago, in front of North Africa. Its flora, including more than 600 endemics, is rich in taxa of remarkable ornamental interest some of which since the XVI century are cultivated in European gardens and parks. Several species, such as *Phoenix canariensis*, today characterize artificial landscapes throughout the Mediterranean. In this symposium the ornamental flora of the Canary Islands is treated by A. Santos Guerra who particularly emphasized endemism and its value, even potential, in gardening and marketing. With respect to Turkey, the wild representatives of *Tulipa* and *Hyacinthus*, symbolic genera of Turkish ornamental horticulture, are surveyed by N. Özhatay, M. Koçyiğit, and S. Demirci, also taking into account their possible place in garden. Finally, a systematic and phytogeographical review of the genus *Crocus* is provided by L. Can and O. Erol which put a special emphasis on the taxa discovered in the last decades and their ornamental interest.

Indeed the reviews presented in this symposium focus on the present and potential status of the ornamental flora at the extreme borders of the Mediterranean. These analyses could represent a starting point of a comprehensive inventory of the ornamental heritage, including its wild representatives, in the whole Region.

Ornamental flora of the Canary Islands (Macaronesian region)

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Canary Islands, one of the macaronesian archipelagos with an extension more than 7000 km^2 and the highest altitude in Spain (3718 m) have also different habitats and ecosystems including the richest flora of the region with more than 600 endemic species and numerous subspecies, varieties, natural hybrids and ecotypes. Part of this flora has a very remarkable ornamental interest which was noted by travellers during several centuries. Some of the most rare and peculiar species were cultivated for long time in the most famous gardens of London, Paris or Amsterdam since the XVI century such as the beautiful Isoplexis canariensis, Convolvulus canariensis or Sideritis canariensis. From then, there are also very popular different cultivars of daisies originated mostly from the endemic Argyranthemum frutescens.

Not only the famous canarian date palm (*Phoenix canariensis*) but other well known garden plants such as the Cinerarias were originated from some canarian endemics belonging to the actual genus *Pericallis* which is exclusive to Macaronesia. Several families possess endemic species at the Canaries including many ornamental ones such as: *Asteraceae* (*Argyranhemum*, *Gonospermum*, *Sonchus*, *Vieraea*, *Pericallis*, etc.), *Boraginaceae* (*Echium* sp.pl.), *Brassicaceae* (*Crambe*, *Erysimum* and *Parolinia*) or *Fabaceae* (*Cytisus* sp.p., *Lotus* sp.pl., *Teline* sp.pl.). Several other families include not well known ornamental endemics such as *Araceae*, *Amaranthaceae*, *Globulariaceae*, *Convolvulaceae*, *Crassulaceae*, to mention some of them.

Indeed the ornamental flora of the canary island has a high value and potentiality to increase the number of ornamental plants used in garden and marketing.

Two important symbol genera for Turkey: *Tulipa* and *Hyacinthus*

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In Turkey, about twenty types of wild tulip and two types of wild hyacinth occur and they are symbols of the country of horticultural points of view. In this paper the wild Turkish represantative of these genera will be presented.

The genus *Tulipa* L. in Turkey:

In the genus *Tulipa* two main subdivisions are recognized, the *Eriostemones* Boiss. and the *Leiostemones* Boiss. In order to facilitate identification, it is arranged the 18 Turkish species of which 7 endemic under these two subdivision:

Subdivision I: *Eriostemones* Boiss.: Perianth segments with hairy claws, the outer narrower and/or shorter. Filaments unequal, the inner ones longer, all swollen at base.

T. biflora Pallas
T. humilis Herbert
T. koyuncui Eker & Babaç (end.)
T. saxatilis Sieber ex Sprengel
T. sylvestris L. var. *sylvestris*
var. *australis* (Link.) Pamp.
T. orphanidea Boiss. ex Heldr.

Subdivision II: *Leiostemones* Boiss. (Sect. *Tulipa*): Outer perianth segments longer and wider than inner ones. Filaments not swollen, hairy base.

T. agenensis DC.
T. aleppensis Boiss.
T. armena Boiss. var. *armena*
var. *lycica* (Baker) Marais (end.)
T. cinnabarina K. Persson (end.)
T. clusiana DC.
T. gumusanica Terzioğlu (end.)
T. julia C. Koch
T. praecox Ten.
T. sintenisii Baker (end.)
T. sprengeri Baker (end.)
T. undulatifolia Boiss.

The genus *Hyacitnhus* L. in Turkey:

H. orientalis L. subsp. *orientalis*
subsp. *chionophilus* Wendelbo (end.)

Most of the wild Turkish species are showy and worthy of a place in garden.

The synopsis of the ornamental genus *Crocus* (*Iridaceae*) in Turkey

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The taxa belonging to the genus *Crocus* L. are geophytes with a subterranean corm, which helps the plant to survive the harsh conditions of a year, such as the summer heat and drought. However, the advantage of getting over the harsh conditions turns into a disadvantage in the reproduction process. The crocuses have a very short, a considerable cool and rainy time to flower and attract their pollinators. Most of the geophytes overcome this situation by producing flowers with remarkable colours and temptress scents for their pollinators. The flowers of geophytes caught the attention of the human being as well. For years the geophytes gained their place in the rock gardens, private gardens or botanical gardens; and, of course, the crocuses stood out amongst these geophytes.

Taxa of this ornamental genus have a distribution from West China to Middle Europe. However, the richness and diversity of crocuses can be observed in the Mediterranean Basin; the diversity centre can be located more precisely in southwest Anatolia, Greece and the Balkans. The climate in the distribution area of the taxa can be characterized as cold winters, rainy and chilly spring and autumn, hot and dry summer. This climate resembles to the Mediterranean climate and can also be found in some parts of the Irano-Turanian as well as the Euro-Siberian phytogeographic region. The developmental stages of the plant can be observed from autumn to spring, whereas the plant "sleeps away" the summer season. Many taxa begin to grow their aboveground organs together with the autumn rains and flower right after; however, some prefer to flower in early spring, when it is slightly warmer.

The genus *Crocus* is a very active plant group from a botanist's point of view. More than 30% of the taxa were discovered and introduced in the past 30 years, the better part of them from Turkey. Currently, there are 92 taxa distributed in Turkey, 31 of them introduced to science in the past 30 years. The complex systematics of the genus led to misplacement of many new taxa into wrong systematic subgroups, which were replaced with detailed molecular biology studies. Another focus point of the studies is the "subspecies system" of the genus. The problem can be easily explained by the fact that *Crocus biflorus* Mill. possesses 21 subspecies. This presentation sums up the last developments within the genus with a special emphasis to its ornamental properties.

The present and future of Mediterranean floristics, introduction, with special reference to the Flora iberica project

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The floristic knowledge of the Mediterranean flora is still rather uneven, as the flora of the southern European countries is rather well known, most of them with very good modern synthetic Floras available, while most N African and some E Mediterranean Asiatic countries are still waiting for modern floristic synthesis. This Symposium will show the progresses of floristic studies in the Iberian Peninsula, Balearic Islands, Morocco, Algeria, Tunisia, Greece, Serbia and Turkey, while Italy and the Italian islands will be covered by the Symposium on "Taxonomy and floristics in Italy". As far as the Iberian Peninsula and the Balearic Islands are concerned, an ongoing project, Flora iberica, is a good example of a modern flora that although presented in the traditional way, incorporates karyological data and takes into consideration, particularly in the last published volumes, the contribution of molecular biology to taxonomy. The first volume was published in 1987 and so far 16 more volumes have been published. Vol. 20 is expected to be printed by the end of 2013, and vol. 9 will follow. *Compositae* and *Gramineae*, the two families still missing are currently in preparation. *Compositae* (vol. 16) will be published in three parts, the first of which (covering *Cardueae*) is expected to be printed in 2014, and the other two parts will be printed not later than 2016. It will be followed by the last volume (vol. 19, *Gramineae*) still to be completed, which will also be printed in three parts. Everything going as programmed, Flora iberica will be end by 2019-2020. This is a good example of co-operative project centered in the Royal Botanic Garden, Madrid under the lidership of the late Santiago Castroviejo first and then under Carlos Aedo. A total of 230 botanists from 18 countries has contributed to this modern illustrated Flora which facilitates the biological study of the flora of the richest floristic area of W Mediterranean.

Bilan et horizons des recherches floristiques (plantes vasculaires) au Maroc

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Le bilan et les horizons des recherches floristiques sur les plantes vasculaires du Maroc sont abordés sous 4 chapitres différents : Inventaires, Flores (clés d'identification), Connaissances systématiques/taxonomiques et Aspects chorologiques/biogéographiques.

Pour toutes ces questions, l'état des lieux est présenté et discuté en soulignant les principales lacunes. Les conclusions sont claires en ce qui concerne les besoins en connaissances et donc les projets prioritaires à court et moyen termes.

Les auteurs proposent que les actions et efforts futurs doivent s'articuler autour des trois axes suivants :

- Travail de terrain et de laboratoire pour compléter et mettre à jour les connaissances systématiques et chorologiques;
- Compléter et améliorer l'état de la base de données "Flore vasculaire du Maroc";
- Corrigenda et Addenda à la "Flore pratique du Maroc" et envisager la préparation d'une Flore complète, richement illustrée, sous format "traditionnelle" et/ou électronique.

Etat des lieux et perspectives de recherches sur la flore méditerranéenne d'Algérie et de Tunisie

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L'histoire de la botanique moderne en Algérie et Tunisie a commencé à la fin du 18e siècle avec les explorations et les ouvrages de Poiret (Lettres de Barbarie) et de Desfontaines (Flora Atlantica). Avec la colonisation française, les explorations sont devenues intenses en Algérie entre le milieu du 19e et le milieu du 20e siècle au point que la flore du pays était la mieux connue d'Afrique du Nord, surtout dans l'ouest (Oran) et le centre (Alger). La Tunisie progressait également, mais à un rythme un peu inférieur. Avec l'indépendance (1962) et la parution concomitante de la flore de Quézel & Santa (1963), les travaux sur la flore d'Algérie ont pratiquement été stoppés, car la première génération de chercheurs algériens s'est limitée à étudier la végétation (phytosociologie et cartographie). En Tunisie divers travaux d'inventaire et de systématique se sont poursuivi pendant la fin du 20e siècle par des chercheurs européens mais aussi tunisiens, et leur synthèse en a été faite dans le Catalogue Synonymique de Le Floc'h et al. (2010). A l'échelle du Maghreb, la synthèse bibliographique la plus complète et la plus récente (Dobignard & Chatelain, 2010-2013) fait état de plus de 4000 espèces/sous-espèces en Algérie et près de 2600 en Tunisie. Depuis les années 2000, un renouveau s'est fait sentir, tant en Algérie qu'en Tunisie, pour les études d'inventaire sur le terrain et de systématique botanique (biologie moléculaire, herbiers). Le signalement de nombreuses xénophytes récemment installées mais aussi de plusieurs espèces spontanées jusque là négligées est venu enrichir les catalogues floristiques des deux pays. Les études moléculaires naissantes promettent des perspectives systématiques intéressantes, tandis que le renouveau des études morphologiques comparatives et de la valorisation des herbiers ont récemment abouti à des recombinaisons nomenclaturales et même à quelques descriptions de nouveaux taxons. Actuellement, l'inventaire des xénophytes et l'exploration des quelques zones encore inexplorées se poursuivent, tandis que le bilan des zones artificialisées ou fragilisées et des taxons en régression voire disparus doit devenir une priorité. Enfin, des révisions taxonomiques « amphi-méditerranéennes » prenant en compte et confrontant les connaissances acquises sur les deux rives seraient souhaitables et paraissent aujourd'hui possibles.

The present and future of the flora of Greece and its conservation assessment

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A brief review on the Greek botany and flora study of, approximately, the past 50 years, i.e. after Rechinger to the ongoing 'Flora Hellenica' project, is presented. The present status of the Greek flora is illustrated through the relevant work conducted in Greek University Institutes and Museums, but also in significant foreign centres (Lund, Berlin and now Palermo), devoted to its study.

Species conservation and habitat management are outlined, as well as future priorities that need the support of floristic and phytogeographical work. In the two Red Data Books (1995 & 2009) of the Greek flora, about half of the endemic, rare and threatened taxa are described and discussed.

During the last two years, the Universities of Athens, Thessaloniki and Patras, with the collaboration of some foreign scientists, have been engaged in an important collaborative project, i.e. to compile the "Vascular plants of Greece: An annotated checklist", which will be published as a separate volume of the journal "Englera" 31 (Berlin).

The richness of the flora of Greece, increases with every day, as new taxa and new distributions are discovered. Searching IPNI for names published since 01.01.2010 with "Greece" mentioned in the distribution notes, more than 50 taxa are found to be referred! This could mean that further floristic investigations in the future may increase the number of taxa to more than 6000.

Unfortunately, the financial crisis in Greece functions as an inhibitory factor on the thorough study of the flora of Greece, since young scientists are no longer getting appointed in the Universities and no funds become available for such purposes. Nevertheless, despite the above difficulties, new taxa for the Greek flora still keep getting discovered.

Mediterranean flora and its conservation in Turkey: with special reference to Monocot Geophytes

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Turkey is a large peninsula with a land surface of 779.452 km^2 and it is divided into 7 geographical regions "Mediterranean, Marmara, Aegean, Black Sea, East Anatolia, Central Anatolia, Southern Anatolia" Phytogeographicalpoint of view, Turkey falls 3 distinctive floristic regions: 1. Euro-Siberian; 2. Mediterranean; 3. Irano-Turanian that tie in closely with the three climatic zones, and these are the key to understanding the floristic richness of Turkey. The Mediterranean floristic region covers three geographicalregionsof the country's sevengeographical regions with about 225.00 km^2. In Turkey Mediterraneangeographical region boats the highest number of endemic species confined to a single region. In Turkey the Mediterranean floristic region supports 42.1% endemism.752 Monocots taxa occur in Mediterranean Floristic Region of which 564 geophytes Principle threats to the area in Turkey include urban and industrial development, road construction, drainage of coastal and inland wetlands, dam construction on Principle Rivers and so on.

Josif Pančić and the New Flora of Serbia

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When back in the mid 19th century, fascinated by lectures by famous József Sadler, Josif Pančić (1814–1888) decided to become a botanist, he still could not know that this path would take him to Serbia where he would become the first and the most famous botanist and one of the great names of Serbian science. At that time only about 200 species were known from Serbia, and August Grisebach even stated that Serbia has little to promise to botanists. In his two most important works, Flora of the Principality of Serbia (1874) and Supplement (1884), Pančić disproved that statement by proving that flora of Serbia is rich in species and deserving the attention of botanists. The complex picture of composition, structure and diversity of flora was based on these two books for almost a century, while taxonomic and phytogeographic studies were neglected in Serbia for quite a long time as they were considered "outdone and unfashionable". Although these books were published in late 19th century, the flow of time has not diminished their validity and authenticity at all. The data collected by Pančić were not only the starting point but also the solid foundation for preparing the eight-volume edition Flora of SR Serbia in just six years (1970–1976), and the first volume was published 96 years after the Flora of the Principality of Serbia. This sudden drive in floristic studies soon resulted in two volumes of supplements (1977, 1986), while the fundamental studies on flora, in function of acknowledging biodiversity and providing nature conservation, found their deserved position during the next decades. Consequently, just about two decades after the first volume of Flora of SR Serbia was published, the Serbian botanists gathered again in order to prepare the second edition, and Pančić participated also through his literature titles. This was not caused by mere sentimentality or historical reasons, but by genuine eternal value of his work. This is confirmed by the presence of 2422 species in Pančić's Flora and Supplement, which is about 68% of species known in present-day Serbia that has a much greater territory than in Pančić's time. Spring of 2014 will mark 200 years since Pančić's birth and 168 years since his arrival to Serbia, whose flora he devoted more than forty years of his life.

Taxonomic data in the information age - state of the art

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The information age, as the period of time that we are witnessing since about two decades now, has a huge impact on the way taxonomists do their science. IT developments coin our workflow from specimen and data collecting, collection management, data sharing and presentation, to publication of scientific results in (still) printed and electronic journals or monographs. The internet has a key role in data exchange and presenting digitized collections. While digital collection management has achieved a rather high level in many countries already, taxonomy itself seems still to be affected by the digital world to a minor and less advanced degree. Creative parts of the taxonomic work may never be totally computerised, and the process of comparing and analysing the physical specimens may be greatly assisted, but not replaced by purely digital tools. However, the challenge of making taxonomy an e-science, at least in part, has been taken up by many projects and working groups. Difficulties, on the purely computational as well as on the level of taxonomic workflows, have proven to be underestimated by many, yet, after sometimes very long and costly developments, convincing examples of digital tools for taxonomy, taxonomists and for the users of the work they produce are now available. Some projects have managed to secure constant development and improvement of their tools, trying hard to keep pace with the permanently accelerating developments in the IT world. Scratchpads are a successful way to foster collaboration between working groups and to present taxonomic results on the web. Electronic floras (e-floras) and checklists are produced in many different ways, showing the clear advantage of presenting an unlimited number of images and additional data at no additional costs when compared to printed floras. Tools like Xper^2 are available to manage descriptive data in a structured way, enabling the production of standardised taxonomic descriptions and keys. Geo-tools like the EDIT map viewer can produce specimen-based dot maps a lot easier than before.

To move the production of whole taxonomic monographs and electronic floras entirely to IT-based tools is the hardest challenge which is ideally achieved by a platform which integrates all available tools in one, a task which is tackled by the EDIT platform for Cybertaxonomy.

Emonocot: biodiversity informatics for monocot plants

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eMonocot is a project delivering a global online biodiversity information resource for monocotyledons. When complete, it will enable identification of Monocot plants, promote understanding of their diversity and evolutionary relationships, and allow the user to explore a wealth of information including descriptions, images, conservation, geographical and ecological data.

eMonocot is in concept a distributed information system. The content underpinning the project is being compiled by monocot plant systematists from many different institutions worldwide . Their data are being contributed through online taxonomic information resources, specifically new community-led scratchpad websites created as part of the project (currently 28; http://about.e-monocot.org/list-emonocot-scratchpads). These scratchpads are providing support and tools to enable monocot taxonomists and their communities to manage and present their taxonomic data online and in doing so contribute to eMonocot. Global participation is essential to developing and sustaining both this data and the expert taxonomic communities that generate and enhance it. There is also a dedicated team of project staff compiling content.

The eMonocot portal (emonocot.org) is linking eMonocot scratchpad content to existing eTaxonomic resources including CATE-Araceae (http://araceae.e-monocot.org/), Palmweb (www.palmweb.org), Grassbase (www.kew.org/data/grasses-db.html) and the Monocot checklist (www.kew.org/wcsp/monocots) via Darwin Core archives (DwC-A). The portal is geared primarily to users of systematic data such as those studying the ecology, evolution or conservation of monocot plants. The presentation will conclude by examining the further development of eMonocot, including its potential as a model for World Flora Online 2020 and for the portal to enable novel biodiversity science.

eFAN : a free electronic database on flora of North Africa

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Tela Botanica Network, http://www.tela-botanica.org

A group of botanists from both shores of the Mediterranean has recently created a collaborative project on North African flora with the aim of gathering botanists from different countries who are interested in this subject. All the people involved in this project will be volonteers and the data will be provided freely. A committee made out of active members has been organized around a Web platform dedicated to this project.

Important initiatives carried out in recent years encouraged us to launch this project 1) The digitization of herbarium plant types from North Africa (GPI program supported by the Mellon Foundation) 2) the publication of the synonymic index for North African flora by the *Conservatoire et Jardin Botaniques de Genève* 3) the edition in 2010 of the *Catalogue synonymique commenté de la Flore de Tunisie* by *La banque de gènes de Tunisie* 4) the publication of Moroccan flora by the *Institut Scientifique de l'Université Mohamed V de Rabat*.

A preliminary meeting funded by the Agroplis fondation (Pl@ntNet project) was held in Montpellier in June 2012 to set the bases of the project. We met again in Tunis in June 2013 to formulate the following proposals:

- bring together all bibliographic data in one internet access point, with links to the existing sites which distribute electronic documents about the North African flora;
- identify all herbaria containing a significant number of North African plants;
- describe the content of these herbaria in the shareable database Pl@ntNet-DataManager;
- give access to the herbarium plant types through the synonymous index of North African flora;
- gather field observations with Tela Botanica's "On-Line Notebook" to download and to view real time data on georeferenced maps;
- map biogeographical regions in order to display the distribution of North African plants;
- disseminate available data on flora: synonymy, vernacular names, ecology, distribution, photographs, etc.;
- create identification keys for morphological groups of plants by using the expert system XPER^2;
- carry out actions in favor of training and promoting exchanges between countries : botany courses on the Internet, field workshops, university exchanges, etc...

See: http://www.tela-botanica.org/page:projet_Afrique_du_Nord

The eFAN project is financially supported by the Yves Rocher Foundation / Institut de France.

Handling descriptive data: Xper^2 and Xper^3

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Xper^2 is a software dedicated to manage descriptive data and to produce interactive identification keys . It is completely free, and it has been actively maintained and enhanced for several years in the Laboratoire Informatique et Systématique in Paris.

Xper^2 consists of three components: two java desktop applications (one used to manage the descriptive data contained in knowledge bases, and one used to perform interactive identification of the taxa described in these knowledge bases) and a java applet which allows users to perform interactive identifications online.

Thanks to its user-friendly interface, its complete set of tools dedicated to compare data and check its consistency, and its ability to import and export data to many different formats, Xper^2 has been adopted by many users. Some of them use the software for a complete process, from data editing to online publishing, including interactive keys for extant as well as fossils organisms. Other users choose Xper^2 as the most convenient tool for a specific task in their workflow, such as editing structured data, comparing descriptions, selecting the most useful characters to distinguish taxa, structuring morphological data and prepare NEXUS files for phylogenetic analysis, or creating interactive keys.

We are constantly improving our software, both at the knowledge representation level and at the functionality level. The spirit of the Laboratoire Informatique et Systématique is to keep our system open, thus facilitating connections to other tools which use standardized input and output formats (SDD, NEXUS, wiki). To do so, we favor the use of modular and open technologies such as web services, while paying particular attention to the user interface, in order to allow taxonomists to use our tools with little or no adjustment time.

The developments undertaken in recent years have allowed us to reach the following milestones: **1)** The development of several web services, including a single-access key construction web service, and a Delta to SDD conversion web service. Other web services will be developed, every time a feature developed internally will be deemed relevant for integration with external tools and services. **2)** The extension of the knowledge representation model, in order to handle taxonomic hierarchies and multiple instantiations of a concept (using the Scope feature of the SDD format). **3)** The implementation of a web version of the descriptive data editor, Xper^3, which uses modern web technologies (such as HTML5, Javascript, Ajax) and allows collaborative work on a single knowledge base by multiple users. **4)** The development of a new version of the online interactive identification interface, using modern web technologies, which makes its much more flexible than the current Applet. This interface is integrated in Xper^3, and its flexibility makes it possible to adapt the interface depending on the content of the key and the audience (For instance, we developed a custom interface for the future new portal of SPIPOLL citizen science project). **5)** The development of an interactive identification web service, used as the backend for the interactive identification web interface: Mkey+.

An application on Mascarene Dombeyoideae has allowed us to test the integration of our developments with the tools supported by the ViBRANT project (the Xper^2 identification Applet and the IKey+ web service are connected to a Scratchpads on this group of plants). This was also an opportunity to test the export of content from Xper to mobile applications. We will now offer two different ways for scientists to identify specimens on the field using mobile applications:

1) Scientists who do not have an internet connection on the field can use the Malaco-fr android app, which can freely import Xper content. **2)** Scientists with an internet connection on the field can use our the smartphone-compatible versipn of the new identification web interface on Xper^3.

Although extensions are underway, we are aware of the limitations of the knowledge representation in Xper^2. We are interested in using the tools coming from the ontology field in order to enhance the integration of databases and characters across studies and to allow data mining and complex inferences. We are developing a metamodel and using Protege to validate a data transfer from the Xper data model to an OWL model according to this metamodel. This work on phenotype modelling and ontologies is tested with the characters of Corvez (2012) on ferns and bridges with Plant Ontology and PATO (Phenotype and Trait Ontology).

A better articulation between Xper and Lisbeth (a phylogenetic tool developed in the lab.) will benefit from the implementation of a common semantic model and links with existing ontologies.

Digital identification tools: progress and problems

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The old, paper-printed dichotomous keys are progressively substituted by new, computer aided tools for the identification of organisms, which can be queried via different types of interfaces. In the last decade the Department of Life Sciences of the Trieste University has produced more than 1000 computer-aided identification tools to plants, animals and fungi using an original software patented by the University (FRIDA). The software generates three different query interfaces (dichotomous online, free-access, multi-entry), which were tested on different types of users, from professionals to absolute beginners, incl. also elementary school children. The results are quite surprising: all users gave higher scores to the dichotomous interface, and the lowest scores to the free-access interface, which was often considered as being user-unfriendly. In order to fully exploit the potential of computer-aided identification tools outside the narrow circle of specialists we have designed a new system, which integrates a multi-entry query interface with a computer-aided dichotomous key. The latter is invoked only to identify the species returned by the multi-entry interface. The new system incorporates the input coming from users' experience, incl. several suggestions for improving terminology, graphics, portability on mobile devices, and the possibility of adding user-generated content to the system. The new system has been submitted to testing as well, and compared with the three original query interfaces: the average time for identification is considerably reduced, the number of misidentifications is slightly lower, and the satisfaction of users has consistently increased. The system is now being widely implemented (in several languages) to include projects for schools and portals devoted to local floras e.g. of National and Regional Parks and Reserves, as a mean to promote the knowledge and appreciation of biodiversity.

A web collaborative project to store and map botanical data

Venanzoni R., Aleffi M., Assini S., Bonini I., Chiarucci A., Feoli E., Gigante D., Guarino R., Foggi B., Geri F., Gubellini L., Landucci F., Lastrucci L., Lucarini D., Maneli F., Mariotti M., Panfili E, Peccenini S., Perini C., Rosati L., Santangelo A., Strumia S., Taffetani F., Vanacore Falco R., Viciani D., Vidali M., Tacchi R., Zuccarello V.

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The present paper aims to develop a debate about the possibility to realize a web common project to store and map botanical data. In the last years, the idea that different kinds of botanical databases could be realized, developed and than brought together, has been promoted. This strategy, in theory fascinating, has often been adopted at national and regional level but the results look like Babel of information.

AnArchive (http://www.anarchive.it) is an open source web geodatabase designed to store, retrieve and analyze herbarium, floristic and vegetation data. A synthesis of technical details, ontology and other information is available on the web page http://www.anarchive.it/anArchive/storia.jsp. It was based on the work of volunteers of academic provenience who wished to share resources, competences and data. Started in 2000, as an interuniversity collaborative project, it has been initially supported and developed by a team of researchers from the Universities of Perugia, Camerino and Siena (Venanzoni & al 2003; Bonini 2012). During the last 12 years, the project grew up, involving more and more universities (18), private and educational institutions, for a total of 122 active users. Mainly designed for herbarium specimens and floristic data, the project gradually enlarged its target including to vegetation plots and phytosociological data within the twin project VegItaly (http://www.vegitaly.it), adopted by the Italian Society for Vegetation Science (Landucci & al. 2013; Venanzoni & al. 2012). Another application was the atlas of Tuscan Pteridophytes (http://geo.anarchive.it/gis/map.phtml?config=fra) developed by the G.I.F.T. project (http://www.atlantefloratoscana.it/site2/?page_id=80) (Geri & al. 2011, 2013) and Liguria monitoring network (Mariotti & al. 2013), etc. Actually the improved structures and applications give secure support for data, privacy and opportunities to users to facilitate research and exchange, to publish each-others data, to build maps and visibility to the web-searching engine as Google is ensured (Venanzoni & Panfili 2010; Gigante & al. 2012; Venanzoni & al. 2012).

One of the most significant targets reached by the working group is the Web-GIS engine and the master taxonomic list. The Web-GIS engine is based on MapServer and Pmapper, support maps according to the most common floristic grid e.g. CEM, UTM (10 or 2 Km square), etc. or point-to-point. The master list actually includes 31,963 names of specific and infra-specific taxa both valid names and synonyms. Created to enter correctly accepted names, it was developed to support the storing of botanical data including historical names (pre-Linnaean) and old names in both herbaria, floristic, vegetation samples and plots, Particularly attention was paid to tie the entire name's chain (synonyms) having the same final taxon (valid name) in order to let the user (not necessarily expert) to input the original name or the updated one's (Gigante & al. 2012). The complete master list is available online at http://www.anarchive.it/anArchive/specie/browser.jsp. The taxonomic list is continuously improved and updated according to new publications, revisions and changed taxonomic visions. This model has been appreciated inside the European reference point for the creation of the European taxonomic standard list for vegetation studies named EuroSL (Landucci & al., submitted; Negri & al. submitted; http://vnr.unipg.it/PGRSecure/).

Palynology for the Mediterranean vegetation history: human-environment interactions in a changing climate

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The Mediterranean basin has always featured, and still has, extremely rich environmental biodiversity. This natural richness and variety has been enriched and conditioned by the development of several cultures. A huge set of biological archives provides evidences of flora and vegetation changes in the Mediterranean regions along time. These changes have occurred not only during the distant past, but also in the recent one. Altogether they determined the shape of the present-day plant landscape.

Palynology has been extensively used to reconstruct different scenarios through the geological times. Besides many expected results, some surprises were found. It is not surprising that a consistent contingent of subtropical taxa was still present in the Italian Pliocene flora (Bertini & Martinetto 2011, Palaeogeography, Palaeoclimatology, Palaeoecology, 304: 230-246; Sadori & al. 2010, Quaternary International, 225: 44–57) and that steppe and grassland formations covered in most occasions the Mediterranean lands during glacial times (Bertini 2010, Quaternary International, 225: 5-24). On the contrary, the presence of dense oak forests in central Sicily around 9000 years ago (Sadori & Narcisi 2001, The Holocene, 11: 655-671), the expansions of *Abies alba* woods along the central Tyrrhenian coast until mid Holocene (Bellini & al. 2009, The Holocene, 19: 1161-1172), and the persistence of pine forests in central Spain until the last millennia (Carrión & al. 2010, Review of Palaeobotany and Palynology, 162: 458–475) could be puzzling.

If we consider the vegetation changes occurred in the last millennia we have to admit they are the results of interlaced environmental and cultural changes (Mercuri & Sadori 2013, chapter 30, The Mediterranean Sea: its history and present challenges. Springer, Dordrecht; Sadori et al. 2010, Plant Biosystems, 144: 940 – 951). Mediterranean habitats have been continuously transformed by climatic changes occurring at a global scale. In the meantime, the environment has been exploited and the landscape shaped by different human groups and societies (Mercuri & al. 2011, The Holocene, 21: 189-206; Kouli 2013, Vegetation History and Archaeobotany, 21: 267-278; Mercuri & al. 2013, Quaternary International 303: 22-42). Joint actions of increasing dryness, climate oscillations, and human impact are hard to disentangle, and this becomes particularly true after the mid-Holocene (Roberts & al. 2011, The Holocene, 21: 3-13; Sadori & al. 2011, The Holocene, 21: 117-129).

Important changes in Mediterranean vegetation seem to have coincided either with marked increases in social complexity or with enhanced aridity during the Holocene, or with both of them.

The origin of the Mediterranean vegetation

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The Mediterranean has been impacted by several climate changes since old times and to predict Mediterranean vegetation response to future climate changes it becomes crucial to understand the behavior of Mediterranean taxa through its complex history. Mediterranean vegetation expansion fits today to Mediterranean bioclimate with long dry summer and mild-wet winters and it looks very sensitive even to tenuous or extreme events as demonstrated by numerous works developed on past records.

Mediterranean typical vegetation as usually observed today is the outcome of the influence of geological and climatic history the Mediterranean area. In fact, the present-day Mediterranean diversity was very weak during the Paleogene (66 to 23.03 Ma) and the first provable precursors of a Mediterranean group occur during the Oligocene (33.9 to 23.03 Ma). Thereafter, during the Neogene (23.03 to 2.59 Ma), the Mediterranean vegetation unit is individualized and progressively enriched to become a distinct and perennial group of taxa. At this time, the Mediterranean bioclimate probably began to take its place especially with the initialization of the Mediterranean seasonality. Later, the Pleistocene Glacial/interglacial cycles have periodically impacted the Mediterranean vegetation through the progressive onset of drastic droughts more and more intense towards the present. The last aridity increase that occurred during the upper Holocene has been largely strengthened by the effects of the anthropic impact over the Mediterranean area. Such a history drives the present-day Mediterranean vegetation puzzle that is and will be particularly vulnerable to human pressure and future climate change.

Pollen records of Holocene vegetation change and the conservation of Mediterranean biodiversity

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Pollen data provide the main way of reconstructing long-term vegetation change but, to be most useful, they need to be converted into a form that is comparable with phyto-geographical evidence. The pseudo-biomisation (PBM) approach (Fyfe & al., Holocene, 2010, 20, 1165–71) was developed to provide a simple and easily applied transformation of fossil pollen data into land-cover classes in order to reconstruct changes in landscape ecology through time. Within this method pollen taxa are assigned to one of a range of possible Land Cover Classes (LCC) based on modern community assemblages using the indicator species approach. For each pollen sample, a modified pollen sum is calculated based on the taxa assigned to each LCC. The PBM has been tested and refined through application to an extensive modern pollen dataset and comparison with Corine remote-sensed land cover maps for Europe. In the circum-Mediterranean region modern vegetation assemblages were established during the early-mid Holocene and they have subsequently been transformed into a mosaic of different land cover types, agricultural, semi-natural and (more or less) natural by a combination of human actions and climatic change. In this presentation, we present both broad-scale results of land cover change over the last 9000 years in the Mediterranean region and also site-specific reconstructions. The latter may be especially valuable in distinguishing between ecosystems which have experienced major anthropogenic disturbance during their histories and those which have maintained overall land cover continuity during the Holocene, even if species assemblages have often altered. Palaeoecological data can therefore play an important role in identifying key areas and sites for biological conservation in the Mediterranean.

Archaeopalynology of lacustrine records from Greece

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The long and composite history of human presence and activities in the Hellenic peninsula is in-detail documented by the longtime archaeological research. Excavation and survey archaeological records show intense habitation since the Early Holocene and increasing social complexity during the middle and late Holocene: emerge and collapse of cultures, urban centers and states, establishment of exchange and trade routes. The several major cultural changes that have been observed in archaeological records offer the opportunity of comparing human societies and activities with recorded climate variability in the area.

Holocene vegetation record of Greece displays remarkable temporal and spatial variability, revealing the heterogeneity of the landscapes. Pindos mountain ridge separates the Greek peninsula into different climatic regions: a western "maritime", with significantly higher precipitation, and an eastern typical Mediterranean one. In addition pollen records confirm a N-S climatic trend by documenting the occurrence of mixed deciduous oak forests alternated with mountainous conifer and later beech forests in the northern areas and enhanced schlerophyllous evergreen vegetation in the south. Prehistoric human activities, like cultivation, grazing or lumbering, have left an imprint on local plant communities without alternating the regional flora until about 4000BP. Bearing in mind that the tracing of human impact on Holocene plant communities is rather complex -as the expansion of Mediterranean schlerophyllous vegetation can be both the response of human clearance and shift toward drier climates-, the several abrupt short-term episodes of retreat of woodlands recorded (e.g. 8700, 7600, 5600 και 4300 BP) have been explained as the result of either human activity and/or climatic fluctuations.

In that perspective, the comparison of terrestrial high resolution palaeovegetation records with pollen and other mutiproxy climatic data from marine sediment cores of the landlocked Aegean Sea, contribute to the discussion on the main shaping factor of palaeovegetation patterns. This correlation and synthesis of paleovegetation records with the cultural context in times of independently known climatic conditions elucidates the shaping factors of vegetation dynamics in Greece and connect vegetation fluctuations to human and/or climatic fluctuations in an effort of decoding of man–environment relationship in the past.

Present and past pollen rain: aerobiological data applied to palaeoenvironmental reconstructions

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Links between the different fields of palynology gave extremely interesting insight to solve problems of pollen representation in past and present contexts. For example, there is general consensus on the importance of application of archaeopalynological techniques to forensic sciences, or on the studies of modern pollen rains for inferring the Relevant Source Area useful for past land-use reconstructions.

The application of aerobiological studies to past palaeoenvironmental reconstructions is, therefore, a further very interesting field of investigation that, though not still completely explored, may be vector of new important inferences about past, present and future of climate change. Data of airborne pollen of *Castanea* and *Taxus* from aerobiological monitoring are presented as examples of studies on taxa of great interest for the development of plant landscape in Italy.

Airborne pollen was monitored through continuous sampling with a Hirst volumetric sampler for 18-years.

As for *Castanea*, long-distance transport of this pollen is well-known, but studies on modern pollen rain show that a relatively small amount of pollen is compatible with the presence of chestnut trees in the area.

As for *Taxus*, pollen production has decreased, while total woody pollen abundance in air has increased in the time period studied. The trend of the Taxus pollen season shows a delay at the beginning, a shortening of the pollen period, and an advance of the end of the pollen season. This was interpreted as a response to climate warming. In particular, *Taxus* follows the behaviour of winter-flowering plants, and therefore earlier pollination is favoured at low autumn temperatures, while late pollination occurs more often, most likely after warm autumn temperatures.

The use of available collection data for taxonomy and systematics

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Collection data form the basis for all hypotheses in taxonomy (and its synonym systematics). Collections are the evidence upon which scientists base hypotheses of species circumscription, species distribution, phylogenetic relatedness and conservation threat. But what are collections? How useful are the specimens we hold in our cabinets in today's world or e-interconnection and mass data analysis, particularly of molecular data? The commonly held view in our own community is that collections are critical for the rest of the biological enterprise, as is the work of taxonomists. But what kinds of collections do we need to do 21st century taxonomy? I will explore some alternatives to traditional collections, and both problems in the integration of new and old collections for taxonomy and systematics and the meaning of available – just what does it mean to be available? Licensing and re-use of data is fast becoming an issue for both institutions and individuals – how available do things need to be to be scientifically useful? I will argue that indeed, collections are critical, but that we might need to rethink just what they really are.

The mass digitisation effort at the Paris National herbarium: implication and prospects of a new broadly available tool

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Created in the early 90's, Sonnerat-BryoMyco is the result of Paris herbarium's databases merging. Meanwhile, it became the database of the French network of herbaria (*Réseau des Herbiers de France*).

The network members have made the constitution of this base possible by getting involved in different international projects and programmes, such as GBIF, African Plant Initiative, Latin American Plant Initiative, Global Plant Initiative, OpenUp! and E-ReColNAt. The National Herbarium and its partners managed to make out of Sonnerat-BryoMyco a major collection database for botany.

On this background, alongside with the renovation of Paris herbarium, a mass digitisation effort was carried out over the vascular plants and macroalgae's collections of the *Muséum National d'Histoire Naturelle*. The database now gives access to ca. 6 million herbarium specimens, out of which ca. 5.45 million are imaged and basically databased. In order to complete the associated metadata, a citizen science project -*les herbonautes*- started. Internet users are invited to database herbarium's sheet information through a web interface. These data, after quality check, will enrich the database.

Sonnerat-BryoMyco gathers the virtual collections of several ancient and exceptional herbaria. Thus, it constitutes a good example of what could become a modern botanical collection database. Consequently to Paris and its partner's efforts, a massive amount of data is now broadly accessible to the worldwide community of botanists. Sonnerat-BryoMyco's continuous growth involves new possibilities (such as virtual consultation and determination) that need tools to be now developed. This creates broad new horizons for collaborative research in botany. What has been made so far now need corrections, and improvements in its quality, which requires the implication of botanists worldwide.

The use of specimen databases for exploration and conservation

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Databases are not only useful for taxonomic work, but can also help in questions of exploration and conservation. Precondition is a high number of data-based and geo-referenced specimens.

Looking at the distribution of samples of a country / an area, the gaps in documentation are easily visible – could be for inaccessibility of an area, of low number of interesting species (the common ones are often underrepresented in collections) or other reasons. In future field work these gaps could be filled.

When the sample is reduced to a taxonomic limited group, the distributions of the taxonomic units can be analysed and thus the centres of variability of this group becomes visible.

For conservation the sample can be reduced to rare and protected plants. In the resulting map places with concentration of records can be seen. These can be compared with existing protected areas. Needs for conservation politics can be made visible in this way.

Symposium on Mediterranean pollen studies

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During the XIV OPTIMA Meeting, a special symposium will be focus on Mediterranean pollen studies. During this symposium, different monitoring activities supported by phenological, airborne pollen and aeroallergen networks will be presented.

The *European Aeroallergen Network* (EAN)/*European Pollen Information* (EPI) counts with a Pollen Database with more than 600 pollen counting stations all over Europe, which are running form the last decades. One of the main goals on this network has been focusing on the quality assurance measures from valid samples, something essentials for comparative studies among different geographical regions. For this reason, nowadays different national and regional networks involved in the EAN/EPI are assuming the compromise of planning activities to ensure standard methodology and an implemented quality control. Nowadays, EAN/EPI is presented as a technical network in the *European Aerobiology Society* (EAS). EAS counts with different working groups, i.e. Quality Control. A first step has been to review and publish new *Minimum requirements to manage aerobiological monitoring stations included in a national network involved in the EAN/EPI* (IAA Newsletter December 2011) and a second step has been focus on external exercises for proficiency testing in slide reading. The protocol was described in the June 2012 IAA Newsletter and the first results have been presented in the recent July 2013 IAA Newsletter. A total of 45 technicians from 15 countries participated in the QC external exercise. Thank to use of a standardized network, under a quality control process, is possible to offer updated and forecasting information on different biogeographical and bioclimatic regions.

In this symposium an airborne pollen network in the Mediterranean Basin will be presented: *Medaeronet*. Airborne pollen databases offer us information about floral phenology for anemophilous plants and this information is useful for preventive medicine, in the case of sensitized patients that suffer from atopy or asthma to some allergic pollens. In base of this application, nowadays, new monitoring networks are focussed on aeroallergens, taking into account that airborne pollen is not always representative of exposure to the major pollen allergens. Some projects are focus on on projecting long-term monitoring programs to quantify floristic and vegetation changes, with application on agronomy, forestry or green urban spaces. In this symposium different aerobiological processes for modelling, the effect of climate change on pollination in anemophilous plants and the airborne pollen as bioindicator of olive crop forecast in Mediterranean Basin will be presented as different practical cases.

Medaeronet website

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Since 2001, RNSA (French Network of Aerobiology) has been in charge to increase the dissemination of the information about allergy to pollen for the Mediterranean area. So, with the help of the different aerobiology networks of this area, we decided to make a real network of information.

The information provided to RNSA every week is about the quantity of the main allergenic pollens present in most of the countries involved in Medaeronet. Each kind of pollens has different allergy potency (Table 1). This allergy potency is determined according to the nature of the proteins of the pollen.

Table 1. Allergy potency and period of pollination of the main pollens of Mediterranean area.

	Allergy potency	**Period of pollination**
Cypress	Very high	December to March
Plane tree	Moderate	April
Oak	High	April to June
Chestnut	Weak	April to June
Olive	Moderate	May to June
Ash	High	January to April
Grasses	Very high	April to August
Pellitory	High	May to August
Mugwort	High	August to October

In function of the allergy potency and the quantities of pollens, the allergy risk can be established every week for each pollen and each country. To inform about this allergy risk, there are four levels: null, low, moderate or high.

The countries which send us every week their pollen bulletin are:
- Croatia (Laboratorij za aerobiologiju – Barbara Stjepanovic),
- France (Réseau National de Surveillance Aérobiologique – Michel Thibaudon),
- Italy (Associazione Italiana di Aerobiologia – Roberto Albertini),
- Serbia (Laboratorija za palinologiju – Branko Sikoparija),
- Spain (Red Espanola de Aerobiologia – Carmen Galan).

The content of the website (www.medaeronet.net) is based on:
- map for each species. The level of the allergy risk is indicated with colors (null in white, low in green, moderate in orange and high in red);
- bulletin with the comments of each country.

Monitoring Networks in Aerobiology, from pollen to allergens

ALBERTINI R. AND HIALINE WORKING TEAM

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The prevalence and severity of allergic respiratory diseases have increased worldwide in the last decades. Exposure to airborne allergens causes allergic sensitization and respiratory symptoms. Pollen grain counts in ambient air have traditionally been assessed to estimate airborne allergen exposure. Over 400 pollen monitoring stations from different national and regional networks in Europe contribute to European Aeroallergen Network (EAN). The Italian Monitoring Network for Aerobiology (R.I.M.A.®) of the *Italian Association for Aerobiology* (AIA), was born almost 30 years ago and carries out its activities through over 40 centers belonging to Universities, Local Health Authorities, Regional Environmental Protection Agencies and other public or private institutions. However, the exact allergen content in ambient air is unknown. The HIALINE European 7FP project has addressed this issue at the European level, by monitoring *Poaceae, Betula* and *Olea* pollen types and their major allergens, i.e. Phl p5, Bet v1 and Ole e1. Tow samplers, a Hirst type volumetric pollen traps and a high-volume Chemvol® cascade impactor have been used in this study. Some particles, PM between 2.5-10 μm, and >PM10 μm, have been collected, extracted, freeze-dryed and frozen until the immunoassay analysis. The HIALINE project offered the opportunity to build an European network devoted to airborne allergens measurement by using an standardized methods described by Buters et al. (2010). The obtained results showed a correlation between the presence of airborne pollen and aeroallergens, showing that the *Poaceae*, *Betula* and *Olea* pollen types appears to be the main, if not the only, source of allergen. We have shown that exposure to aeroallergens does not only depend on the airborne pollen, but also on allergen emission from pollen, observing >10-fold differences in daily allergen release. Sometimes the observed results point out long-range transport of pollen with different allergenic potency that local populations. These results, obtained during the HIALINE project, will open new ways to understand the mechanism controlling sensitization and symptoms in patients with pollinosis. This information will be very useful to improve diagnostic procedures, clinical trials and specific immunotherapy, through a molecular view of aerobiology and allergology. In addition, some species count with low or not allergen pollen content and authorities and individuals should awareness maintenance and recommend them for public and private green urban spaces for improving the biological quality of the air in our cities. This subject is not often adequately assessed, as it is consider with the pollution in general.

Airborne Pollen Transport in the Mediterranean

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There is an increasing evidence of pollen transport over long distances, including continental or even intercontinental scales. In the atmosphere, interactions of airborne pollen with environmental factors namely with air humidity, can led to its rupture and the release of aeroallergens into the air, a loss of viability due to temperature and UV radiation, or chemical damages of the grains by air pollutants. With very high humidity, pseudo-germination can be triggered resulting in the release of the pollen content into the air, but pollen can also absorb dissolved heavy metals, nitrate and sulphur.

Being located at the crossroads of air masses coming from Europe, Asia and Africa, the Mediterranean area is a complex zone of mixing for pollen of diverse origins. Its topography, with an intricate mountainous system, valleys going in all directions, winds through a good part of the coast, a very narrow littoral climbing to altitudes sometimes exceeding 500 m or even more within only a few kilometres of the coast, influence the weather systems and have strong effects on regional pollen circulations. For instance, the Iberian peninsula with its high plateau and mountain ranges, together with the Pyrenees, the Alps and the Balkans, act as orographic barriers to the East–West displacement of weather systems, separating the central Atlantic from the Mediterranean.

Reduction of the tree canopy by land clearing for agriculture or for wood collection appears to support the invasion of these ecosystems by grasses. Currently the Mediterranean landscapes are being drastically altered by human activities, including expansion of towns, road constructions, tourist infrastructures, leading to changes in local environments and consequently on the features of pollen distributions, as pollen transport often rely on single-point observations at a receptor site in a town. Climatic models further predict that this area will be one of the regions most affected by the ongoing warming trend and by an increase in extreme events. This makes the Mediterranean a natural focus of interest for aerobiology research and a potential model for more global patterns of climate change.

Airborne Pollen transport is routinely monitored on a daily or even hourly basis, by aerobiological networks and recent studies have combined trajectory models and pollen counts in order to provide information on local, regional or long distance transport. In this presentation, *Olea* and grass pollen will be approached as a potential model for the analysis of pollen transport, due to their importance in the Mediterranean and its impact on respiratory allergy.

Climatic change in the Mediterranean area and pollen monitoring

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The weather conditions directly influence pollination by determining time of onset of flowering, the number of pollen grains produced, and by controlling the amount of pollen that is discharged into the air from day to day. The climate in the Mediterranean is mild and wet during the winter and hot and dry during summer. In this area plant physiology is controlled by temperature, but some plants flower when water is available or as day length increases in spring or decreases in summer. Some species respond to a combination of these environmental parameters which interact with both the initial steps of the flower initiation and the speed of the flower development.

In the last decades, it has been an evidence of a significant increase of air temperature with consequent changes on the airborne presence of anemophilous pollen. The changes recorded involve, above all, the timing in which occur the pollination, the peak date, the behaviour of pollen release, whereas any significant influence on the total pollen emission is found. Many studies carried out on long time series of airborne pollen counts have shown an earlier start of pollination in spring flowering trees, such as *Platanus, Quercus, Betula, Pinus, Olea*. For taxa flowering in winter, such as *Corylus, Alnus* and *Ulmus*, this trend is not linear and could even be delayed by autumn higher temperatures which determine insufficient chilling accumulation and later start of the season.

On the contrary of areas of central and northern Europe, in the Mediterranean area more or less stable trends of weeds or grasses have been observed, with a slight tendency to advance or delay of the onset of pollination, depending on the species.

There is also evidence that the length of the pollen season could show significant variations: in general, in the warmest years the pollination is shorter that in the years with lower temperature; in some cases it is also extended, especially in late flowering species or species which start to growth once there is sufficient water availability.

Changes in the parameters which characterize the presence of airborne pollen in the atmosphere of Mediterranean areas appear to be a relatively considerable response to climate change although there are both species and regional differences in the examined models.

Airborne pollen as bioindicator of olive crop forecast for the Mediterranean area

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The pollination in most species is represented by anemophilous and entomophilous processes. While in entomophilous plants pollen transport is generally attributed to insects, in the anemophilous one the pollen dispersion is random through the wind. In this last typology the plant need to reach an effective pollination success by producing large amount of pollen grains to be emitted in the atmosphere during blooming.

Pollen released can be monitored through different aerobiological monitoring samplers and techniques, in particular the volumetric monitoring method permits to estimate average daily airborne pollen per volume of air (pollen grains/m^3).

On the other hand, this method permits also to obtain qualitative evaluation of the pollen grains with optical microscope identification and pollen attribution to a precise species, genus or family. The principal results of this analysis are represented by the pollination curves, which permit to obtain different phenological information (pollen season start, full, end) and by the quantities of the pollen emitted. These information are very useful in medical field considering the pollen calendars for pollinosis, and in agriculture context with plants of economic interest, considering pollen implications as predicting fruit setting and final harvest. Moreover, some plant species can be utilized as bio-indicators in bio-climatic studies evaluating their flowering features in relation to yearly meteorological influences.

In these last years, a common approach was realized between Italian, Spanish and Tunisian research centres to study, through aerobiological investigations, one of the more important anemophilous species, the olive, in the Mediterranean basin. These multiregional pollen networks were located in Andalusia, centre and south Italy and Tunisia.

Aerobiological data and climate characteristics of the study areas were utilized in olive yield forecasting analyses to estimate in advance the potential fruit productions. The principal result of this investigation was the definition of local and regional statistical models to interpret and forecast yearly olive fruit productions useful in the olive oil sector. These models could be also utilized in other anemophilous species of economic interest such as hazel, chestnut, pistachio, date palm.

Moreover, the obtained bio-meteorological databases permitted to establish the olive as an effective bio-indicator in the Mediterranean area, in a climate change scenario for evaluating potential future plant adaptations.

Finally, the olive flowering calendars with the principal pollination periods were utilized in the medical prevention for allergic individuals in the specific monitoring areas, considering that olive pollinosis are increasing in the last years.

Progress in Mediterranean karyosystematics and molecular systematics

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Cytotaxonomy and cytogeography have been largely addressed during long time, mostly based on chromosome number comparison. The subsequent development of karyological techniques (chromosome morphometric analysis, C-banding), allowed researchers to better characterize karyotypes and to compare them within the complex of closely related species. More recently, molecular cytogenetics provided further possibilities in the study of chromosome structure and/or evolution as well as genome organization. Fluorescence in situ hybridization (FISH) is a 30-year-old molecular cytogenetic tool that has continued to develop. In eukaryotes, rRNA genes are the most widely used FISH markers. The number and location of rDNA loci varies within the complex of closely related species; therefore, it can be used as a chromosomal landmark to provide valuable evidence concerning genome evolution at chromosomal level. When karyological relationships between taxa are established by means of chromosome number, ploidy level, genome size, FISH and/or GISH, etc., it is also important to have an independent source of information (e.g. molecular phylogenetics, morphological and micromorphological characteristics, ecology), in order to establish the direction of changes during speciation. In this sense, several talks presented in these symposia combine cytogenetic data with molecular phylogeny and phylogeography.

A further important character that plays a relevant role for the progress of Mediterranean karyosystematics is the genome size, or DNA amount. Genome size is among the basic characters in the biodiversity evaluation and a useful trait in systematics and evolution. Two trends are responsible for the variation in genome size. One is a variation in monoploid genome size, mainly related to transposable element amplification. The other involves duplications of the whole genome, i.e. polyploidization, frequently followed by DNA loss leading to a downsizing in respect to the expected multiple of lower ploidy levels genome size. These two phenomena are major evolutionary driving forces, particularly in plant. Nevertheless, a big amount of taxa have never been studied from this viewpoint. The same incredibly applies to very basic chromosome number determinations, also. This fact should encourage further studies in order to increase the availability of these very relevant biological parameters. However, the research on plant karyosystematics has generated a considerable amount of results, and an effort in compilation of databases has been done for chromosome numbers and, more recently, for genome size and some other cytogenetic information. In the last times this databasing activity has shown a special interest for on-line accessibility. Some oral presentations of these symposia will address this subject, also.

A comparison of plant chromosome number variation among Corsica, Sardinia and Sicily, the three largest Mediterranean Islands

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Recent studies highlighted a trend in the increase of mean chromosome number (CN) together with latitude. For instance, in a previous research based on the Italian, Slovakian and Polish floras, we have demonstrated in a quantitative way that mean CN increases along a S-N latitudinal gradient. In the current study, we compared CN variation among vascular floras of the three largest Mediterranean Islands: Corsica, Sardinia and Sicily to verify whether patterns of variation reflect their similar latitudinal ranges or their different biogeographic/taxonomic contexts. We computed the data from records stored in "Chrobase.it" (www.biologia.unipi.it/chrobase), a chromosome count database for the Italian flora. Since the three islands follow a clear latitudinal gradient, we expected a parallel difference in CN variation. The three datasets comprised 261 (Corsica), 520 (Sardinia) and 975 (Sicily) distinct cytotypes. Although the samples were not homogeneous in terms of number of cytotypes and representativeness of island floras (respectively of 8%, 17%, and 28%), our results do show that mean chromosome number increases along a S-N latitudinal gradient. Indeed, mean CN resulted to increase from Sicily, $2n$ = 27.48 to Sardinia, $2n$ = 31.88 and Corsica $2n$ = 33.59. The most karyologically variable species resulted *Teline monspessulana* (L.) K.Koch ($2n$ = 46, 48 + 0-4B in Sicily), *Genista sulcitana* Valsecchi ($2n$ = 18 + 0-2B, 27 + 0-2B in Sardinia) and *Crocus minimus* DC. ($2n$ = 24, 25, 26, 27, 28, 29, 30 in Corsica). Chromosome numbers range from $2n$ = 6 (*Hypochaeris* in Sicily and Sardinia) to $2n$ = 216 (*Colchicum corsicum* Baker in Corsica). Our results are consistent with the hypothesis of an increase of polyploidy at increasing distances from the Equator, when territories from the same hemisphere are compared, at a geographical scale such as that of Central Mediterranean Sea.

Molecular phylogeny and cytogenetic characterization of the Lebanese *Iris* species

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The genus *Iris* includes 6 subgenera, 8 sections (Mathew 1989) and more than 300 species (De Munk & Schipper 1993). From a geographical point of view, the *Iris* genus occurs through temperate and tropical areas of northern hemisphere. The Section *Oncocyclus*, restricted to southwestern Asia, includes 37 taxa and is still botanically and genetically insufficiently explored.

Mouterde (1966) reported the occurrence of fourteen wild *Iris* species in Lebanon which is, highly debated amongst scientists due to the ambiguities in the identification and classification of the species; especially of the *Oncocyclus* section, which is undoubtedly the most complicated (Mathew 1989). Therefore, more cytological and molecular research is needed for this purpose.

Recently, we conducted genome size evaluation on all Lebanese irises, and chromosome investigations (chromosome number, karyotype, heterochromatin and rDNA patterns) are in progress on majority of these species. Phylogenetic relationships amongst 21 species and subspecies of *Iris* from Lebanon and neighbor countries, mostly of the *Oncocyclus* section, were recovered using nuclear (ITS) and chloroplastic (*trn*L intron, *trn*L-F intergenic spacer, *mat*K) markers. This phylogeny will be used as a framework for studying character evolution, especially those concerning chromosomes.

Polyploidy shaping *Tanacetum*'s diversity in Iran: chromosome number, rDNA organization and genome size

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Tanacetum is a genus of the family *Asteraceae* (tribe *Anthemideae*) and includes about 160 species. It is native to many areas of the Northern Hemisphere, being particularly abundant in the Mediterranean and Irano-Turanian regions. It is considered to hold a crucial position for understanding the phylogenetic relationships within its tribe. Its basic chromosome number is x=9 (as most *Anthemideae*) and ploidy levels are found up to 10x.

In Iran, *Tanacetum* is represented by 37 species, including all ploidy levels, which makes this a good place to study the genus diversity. Many of the studied Iranian *Tanacetum* species exist in polyploid series, including taxa with stable odd ploidy levels such as *T. kotschyi* (3x) or the recently described *T. joharchii* and *T. fisherae* (3x and 5x, respectively).

Applying classical karyology, molecular cytogenetics (fluorescent in situ hybridisation, FISH, of rDNA) and flow cytometry techniques we aim to study the impact of polyploidy in *Tanacetum* genomes. First results indicate genome downsizing as well as a decrease in rDNA loci number with polyploidy, although there are exceptions to these trends. The possible relationships between these and other traits are also studied and discussed, such as flower morphology, which has been a basic feature in classical infrageneric classifications. Finally, the linked rDNA type (L-type), in which both 5S and 18S-5.8S-26S rRNA genes appear together, is confirmed for the genus although in some species the L-type rDNA may have not been fully homogenised.

Genome size variation in Italian species of the genus *Erysimum* (*Brassicaceae*)

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The genus *Erysimum* (*Brassicaceae*), comprising about 200 species, is widespread in the temperate zone of the Northern Hemisphere (Europe, North Africa, Asia and North America). Systematic research for Italian representatives of the genus pointed existence of 18 species, constituting about 9% of global number. Previous studies found four different basic chromosome numbers (x = 6, 7, 8 and 9) and ploidy levels up to 8x for x=7.

The 2C DNA content was assessed by flow cytometry and chromosome number was determined using standard methods. Chromosome number and 2C-values were determined for 11 *Erysimum* species taking several populations of each to verify the existence or not of inter- and intra-specific variations. For 7 species, these constitute first reports of genome size (*E. aurantiacum, E.cheiri, E.cheiranthoides, E.bonannianum, E.crassistylum* and *E.virgatum*).

The 2C DNA value ranges from 0.5 pg for *Erysimum pseudorhaeticum* to 2.01 pg for *E. rhaeticum*). The group of species with the same basic chromosome number showed a strong correlation between ploidy level and genome size. The possible relationships between 2C-values and other characters as life growth form and life cycle type are also discussed.

Evolution and biogeography of the *Campanula drabifolia* species complex (*Campanulaceae*) in the eastern Mediterranean

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The *drabifolia* complex (also known as *Roucela*) is a group of 12, mostly narrow endemic, *Campanula* species found primarily in the Aegean Archipelago. Little is known about the evolution of endemic *Campanulaceae* on these continental islands. This region has a complex climatic and geologic history with numerous sea-level changes and tectonic events causing connections and disconnections between islands and the mainland across time. Additionally, the Mid-Aegean Trench, which formed approximately 9 mya, separates the archipelago into the Eastern and Western Aegean. We use both plastid and nuclear loci and recovered a grade composed exclusively of taxa found east of the Mid-Aegean Trench and a clade that includes primarily taxa found west of the trench. Our results indicate that the Mid-Aegean Trench is historically significant in the evolutionary history of this group. Dating analyses found the *drabifolia* clade to be much older than predicted by often made claims that speciation in the Mediterranean is largely recent and driven by the onset of the Mediterranean climate. The break-up of the Aegean landmass played a significant role in the diversification of the clades found in the eastern side of the trench, while the Messinian Salinity Crisis may have contributed to the divergence within the clade occurring in the western side of the trench. However, we will also discuss in more details individual species histories and some relatively recent migration events from mainland to islands. We will be showing preliminary results from niche-based models to corroborate our hypotheses of geologic events, dispersal barriers, and climatic variables being responsible for species current distributions.

Inferring species networks from gene trees in polyploid complexes by minimising deep coalescences: examples from the genus *Leucanthemopsis* (*Compositae*, *Anthemideae*)

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Polyploidization is an important evolutionary process particularly prominent in plants. Yet phylogenetic reconstructions including polyploids are not trivial due to their genomic complexity. A polyploid can be the result of the genome merging from two or more parental species and this implies that, together with incomplete lineage sorting, hybridization (by allopolyploidization) can be an important process producing incongruence in phylogenetic reconstructions. Disentangling between polyploid hybridization and incomplete lineage sorting is still a hard task when one wants to reconstruct phylogenies in polyploidy groups.

We present a simple method for inferring species networks in polyploid complexes from multilocus gene trees by taking a parsimony approach based on a Minimising Deep Coalescences (MDC) criterion. The method uses the MDC principle as implemented in the software program PhyloNet (Than & al. 2008) to find the optimal (most parsimonious) pair-wise mapping of alleles for each underlying gene and every polyploid accession included. In a second step, the same criterion is used to infer the optimal (most parsimonious) combination of allele pairs across the underlying genes/markers for each polyploid accession. Thereafter a reconstruction of a multi-labelled (MUL) tree is carried out, including all diploid and polyploid accessions simultaneously and having terminal branches that represent either diploid accessions or pseudo-diploid parental genome branches giving rise to polyploids. Finally, the inference of a species network is accomplished by joining parental genome branches either into reticulation (allopolyploids) or non-reticulation (autopolyploids) nodes, using the software program PADRE (Lott & al. 2009). The method is demonstrated in the small genus *Leucanthemopsis* (*Compositae, Anthemideae*). *Leucanthemopsis* includes six species of small pluriannual herbs, with distribution centred in the Iberian Peninsula. It comprises tetraploid, and hexaploid taxa, occurring sometime simpatrically with the diploid species of the genus, and for whom an allopolyploid origin cannot be excluded. For the phylogenetic reconstruction, a total amount of six markers (five low-/single-copy nuclear markers plus one single chloroplast locus) were used. Allelic variation was assessed via 454 next-generation sequencing of amplicons.

Asymmetrical speciation patterns among Mediterranean and Macaronesian *Cheirolophus* (*Asteraceae*)

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The genus *Cheirolophus* Cass. (*Asteraceae*) comprises ≈ 30 species mainly distributed along the Western Mediterranean Basin and Macaronesia. Ten of them are currently recognized in the IUCN Red List as vulnerable, endangered or critically endangered. Previous phylogenetic studies support the existence of two main clades in the genus: a Macaronesian group composed by 20 species inhabiting Canary Islands and Madeira, and a less diversified Mediterranean clade which groups most of the North-African and Iberian species. Our main aim is to unravel *Cheirolophus* diversification using recent advances in the field of phylogeny, biogeography and population genetics. Specifically, we focus on the similarities and differences in the radiation process among Macaronesian and Mediterranean clades.

Our results suggest a simultaneous pattern of diversification in Mediterranean and Macaronesian lineages, coinciding with the onset of the Pleistocene climatic oscillations and the establishment of Mediterranean climate. However, the radiation within the Macaronesian lineage derived in considerably much more species than in the Mediterranean clade. Our analyses detected an increase of diversification rate in the Macaronesian lineage, giving rise to one of the fastest plant radiations observed to date. To explain the explosive diversification of *Cheirolophus* in the Macaronesia, some interrelated factors may play relevant roles. Population genetic analyses -DNA sequencing and AFLP- suggest the importance of insularity, geological history, habitat isolation and plant features in generating current species diversity. In contrast, Mediterranean clade resulted in few species, some of them showing wide distribution areas. In a population genetic study of *Ch. intybaceus* -one of these widely distributed species, displaying a considerable morphological and ecological inter-population variability-, the analyses reported evidences of continuum gene flow. Taking together, these results suggest that the machinery to generate diversity may be powerful and ready-to-used in the whole genus. However, while in continent the gene flow has limited population divergence and restrained the diversification to the intra-specific level, the characteristics of Macaronesian archipelagos may have fueled the speciation engines in *Cheirolophus*.

Two cytogenetic databases: Genome size in the *Asteraceae* (GSAD) and Plant rDNA

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This communication presents two electronic and public databases, which are currently being updated, of interest for plant cytogenetics researchers and, more generally, for those concerned on plant systematic and evolutionary as well as other basic and applied plant biology aspects.

The first one is the "GSAD: a genome size database in the Asteraceae", launched in July 2010 and accessible at www.asteraceaegenomesize.com. This is the first C-value database focused on a specific botanical family, the *Asteraceae*, which includes many representatives of economic and ecological interest and is furthermore considered the largest plant family (≈23,000 species) within angiosperms. The new release has 2,770 entries, and contains genome size information for 186 genera and 1,230 species, data coming from around 134 publications.

The second one is the "Plant rDNA database", launched in February 2012 and accessible at www.plantrdnadatabase.com. It compiles information on number, position and structure of the 5S and 18S-5.8S-26S ribosomal DNA (rDNA) loci in plants (angiosperms, gymnosperms, and a few bryophytes). Current knowledge regarding chromosomal rDNA sites is provided for more than 1,751 plant species (including more than 2,839 different accessions), gathered from 610 publications on fluorescent in situ hybridisation (FISH) experiments.

These web pages display a similar intuitive and user-friendly layout, including basic and advanced search options. We expect to see growing use of these databases for comparative, evolutionary and other kinds of studies, because they quickly supply a relevant type of information otherwise scattered in a variety of sources.

First steps toward the genome size database of the Mediterranean flora

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Nuclear DNA content or genome size is an important biodiversity characters with fundamental biological significance. Information on C-value can be fruitfully utilized in numerous branches of plant science. It is also a useful trait in systematics and evolution. Flow cytometry permits the rapid and precise screening of genome size and ploidy level, hybrid identification, and detection of small differences in DNA content. A rapid overview of DNA C-values in large panels, possible through some papers, but much easier with on-line databases, can reveal interesting aspects such as interspecific, intraspecific, interpopulation and, most rarely, intrapopulation variation. Most frequently these reflect different ploidy levels or presence of B chromosomes.

Several floristic, phytosociological or karyological databases are related to the inventory of biodiversity in the Mediterranean area. The largely most comprehensive database dealing with genome size (Kew plant C-values database) is very general (a worldwide compilation), and presents a number of data based on only one or a very few individuals from only one population an sometimes of imprecise provenance (often from seed banks or botanic gardens). In addition, as it is logical, nuclear DNA amount varies through the populations, reflecting intraspecific diversity, microspeciation processes and ecological isolation among other aspects, so that it is even worth complementing the current data sets with information from taxa already studied in other areas.

Thanks to a huge number of field missions and to a large network of collaborators in different parts of the Mediterranean region, our team has obtained numerous results and acquired a big experience in genome size analysis on rare and endemic plants, and also on those just typical of Mediterranean habitats, both at specific and population scales.

As a result of this plant collecting and genome size estimation effort, and starting with several important works on Balkan and Lebanon floras, we initiated a database of genome size for Mediterranean region (currently containing up to 642 taxa for Balkans and 225 for Lebanon). Some of these results have been or will be integrated into studies with complementary methods to address speciation and evolution of species complexes and to perform studies on endemism and biodiversity dynamics. Progressively, all data concerning Mediterranean region will be incorporated into an interactive database of Mediterranean flora. In this communication we describe the conception of this database as well as its current state and its foreseen development.

Bupleurum (*Apiaceae*) in the Mediterranean: Species boundaries and underestimated diversity

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Bupleurum L. (~180-190 species) is one of the largest and most diverse genera in *Apiaceae*. It includes annual and perennial herbs, and about a dozen shrubby species. It is widely distributed in the World (Northern Hemisphere), with great diversity in the Mediterranean region, where is represented by more than 100 species. Most annual species of *Bupleurum* are well characterized, thanks to the remarkable work of Swedish botanist Sven Snogerup, who has also discovered many new species in the genus. However, many perennial *Bupleurum* species remain poorly understood and require much further study.

An example of the problems that persist in *Bupleurum* is the case of *B. ranunculoides* L., a European species of morphologically diverse populations with multiple cytotypes and various ploidy levels. In the 18th century, some populations and variants of *B. ranunculoides* were recognized as distinct species, but later treated under a single species name, a concept that is still used in the present day. My study of herbarium collections and available cytogenetic data suggest that the current species concept in *B. ranunculoides* is hiding the real diversity in this group of plants and needs revision.

Species limits are also unclear among the taxa that have been associated to, and often included within, *B. falcatum* L., a widespread and highly polymorphic group of plants. My study of *B. falcatum* s.l., using morphology and molecular data, suggest that the broad species concept that has been used in the group is inadequate and does not reflect real species boundaries.

In this communication, I discuss species delimitation problems in Mediterranean and European species of *Bupleurum*, addressing in particular the cases of *B. ranunculoides* and *B. falcatum*. I also discuss the crucial role that digitization efforts, in many herbaria and botanical libraries, can play in bringing to light new species and forgotten species names, some of which could in fact correspond to real species.

The *Daucus carota* complex in France: advancement of research, focus on Mediterranean situation

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A pluridisciplinary research program has been going on for several years on the *Daucus carota* L. complex in France. Many field studies were made for both inland and coastal populations. More than 100 populations were visited, studied in their biotopes, gathered and comparatively cultivated. The following disciplines were then applied: - adult plant morphology, - seedling morphology, - floral biology, - genetics (microsatellite), - agronomical tests (controlled hybridizations, resistance against pests and diseases…). Preliminary first results mainly concerning the Mediterranean flora are presented. Within the subgroup *gummifer*, the Atlantic and Mediterranean entities must be kept separate; on the Atlantic coast, the North-West group and the Basque group are genetically distinct. All the Corsican populations visited are genetically distinct from all others studied, including those of the continental Mediterranean seashore of France. A focus is made on subsp. *maritimus* and subsp. *hispanicus* and their situation is discussed.

Résumé

Depuis plusieurs années, un programme pluridisciplinaire de recherche est en cours à propos du complexe de *Daucus carota* L. sur le territoire français. De nombreuses prospections ont été faites à l'intérieur des terres et sur l'ensemble des littoraux de France continentale et de Corse. Plus d'une centaine de populations ont été visitées, étudiées sur place, récoltées puis cultivées de façon comparative. Les disciplines suivantes ont été appliquées : - morphologie de la plante adulte, - morphologie de la plantule, - biologie florale, - génétique (microsatellites), - essais agronomiques (hybridations contrôlées, résistance aux maladies…). De premiers résultats concernant la flore méditerranéenne sont ici présentés. Dans le sous-groupe gummifer, les ensembles atlantiques et méditerranéens doivent être séparés ; sur la façade atlantique, on note 2 sous-ensembles génétiquement distincts (Nord-Ouest / Pays basque). Les populations corses sont génétiquement isolées de toutes les autres, y compris de celles du littoral méditerranéen continental. La situation des subsp. *maritimus* et subsp. *hispanicus* est détaillée et débattue.

Phylogenetic relationships of *Careae* and related tribes of *Apiaceae*

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Tribe *Careae* Baill. (family *Apiaceae*, subfamily *Apioideae* Seem.) is composed by some quite well known genera such as *Carum* L. to which belongs the cultivated *Carum carvi* (Papini & al. 2007. Genet. Molec. Biol. 30(2): 475-482), together with other less known genera, some of which particularly interesting for their growth form and their ecological niche, such as *Chamaesciadium* C. A. Meyer (Papini 2006. Fl. Medit. 16: 5-15).

The closest sister group to tribe *Careae* is *Pyramidoptereae* Boiss., whose most important genus (for species number) is *Bunium* L. (Degtjareva & al. 2009. Bot. J. Linn. Soc. 160: 149-170).

Our results and those by other authors, such as Degtjareva & al. (2009) show that *Carum* is polyphyletic, with some members of *Careae* (part of genera) appearing to be more strictly related to *Pyramidopterae*. Of particular interest is the relationship between *Carum* and *Bunium*. The results by Degtjareva & al. (2009) show that Bunium is constituted by at least four clades separated one from each other. One of these clades (that containing *Bunium bulbocastanum*) appears to be the sister group of the monotypic *Hellenocarum*, an amphy-adriatic mediterranean genus (formerly known as *Carum multiflorum*). *Bunium pinnatiflium* appears to be related to asiatic genera and to *Carum heldreichii*, a rare species endemic of south mediterranean mountains. *Carum apuanum* appears to be distantly related to the rest of *Carum*, while it appears to be nested within genus *Scaligeria* (insufficiently sampled until now) and, together with this genus, it is the sister group of most of the *Pyramidoptereae*. Tribe *Careae* appears to contain much less species than those that were included in before, with *Carum carvi* L. (the typic species of genus *Carum*) forming a clade with *Fuernrohria*, *Falcaria*, *Aegopodium*, *Chamaesciadium*, *Rhabdosciadium*, *Aegokeras* and *Grammosciadium* (Papini 2006).

Conclusion - The here presented phylogenetic analysis shows that the molecular data (nuclear rDNA ITS sequences) conflict largely with the traditional classification based on morphological data, largely obtained from the fruit. We conclude that morphological characters related to the fruit appear to show often parallelism and hence homoplasy (Degtjareva & al. 2013. Pl. Syst. Evol. 299(5): 985-1010). As a consequence new morphological characters patterns are needed to better indentify and distinguish many members of *Careae* from other genera belonging to *Pyramidoptereae*.

An overview of the family *Apiaceae* in Turkey

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Turkey is one of the reachest countries in the temperate zone in terms of plant diversity and regarded as a gene centre for many plant groups. The main reasons for this wealth are as follows: existance of a variety of climates, geological and geomorhic variation, topographic diversity, many different habitats, three presence of three major phytogeographical regions (Euro-Siberian, Mediterranean and Irano-Turanian), altitude variations ranging from sea level to 5000m and an interesting historical background since the tertiary period to modern times.

Turkey's flora attracts the attention of a large number of domestic and foreign scientists. Approximately every ten days, a new plant from Turkey is described as new to science. It is thought that there is a need for a new illustrated Turkish Flora. Therefore, Turkish botanists have decided to collaborate on this project. This Flora is planned to be completed by 2023, the hundredth anniversary of the foundation of the Turkish republic. As a preparatory work for this new Flora, a plant checklist has been prepared with the participation of mainly young Turkish botanists.

The *Apiaceae* is one of the large plant families that attracts the attention of botanists, and it is the ninth largest family with 475 species, 37 subspecies and 15 varieties in Turkey. The family contains 177 endemic taxa, ten are subspecies, and eight are varieties and the rest are species. Nearly 34% of the taxa are endemic and 52 genera are represented by a single species. The types of 54 taxa (besides the endemics) are from Turkey (18 of which are syntypes). The phytogeographic regions of 280 Apiaceae taxa have been determined: 120 Irano-Turanian element, 44 Euro-Sibirian and 116 Mediterrranean element.

Why is *in situ* conservation of species so difficult? An overview of the issues

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Although the CBD Article 8 clause (d) is quite explicit: 'Promote the maintenance … of viable populations of species in natural surroundings', the conservation of species *in situ* is one of the least understood issues of biodiversity conservation. The main general aim and long-term goal of *in situ* conservation of target species is to protect, manage and monitor selected populations in their natural habitats so that the natural evolutionary processes can be maintained, thus allowing new variation to be generated in the gene pool that will allow the species to adapt to changing environmental conditions.

In situ species conservation covers a broad spectrum of activities ranging from the preparation and implementation of detailed single-species recovery plans in the case of species that are critically endangered (which the CBD includes under *ex situ* conservation!), through vigilance and monitoring for those species that are rare, not threatened or only vulnerable, to various forms and degrees of management intervention which affect either the species populations concerned or the habitats/areas in which they occur or both. An approach that has gained widespread acceptance in some parts of Europe is the establishment of micro-reserves.

In practice, the conservation of species *in situ* depends critically on identifying the habitats in which they occur and then protecting both the habitat and the species through various kinds of management and/or monitoring. In the case of threatened species, their conservation *in situ* also requires that the threats to them are removed or at least contained. Thus, although in situ species conservation is essentially a species-driven process, it also necessarily involves habitat protection.

At a national level, most countries have put little if any effort into species conservation although in Europe several countries (including several in the Mediterranean region) as well as North America, Australia have considerable experience of recovery/conservation plans for highly endangered species. Only a small number of management, conservation plans or recovery plans have been published. On the other hand, conservation of forest species *in situ* is a long-standing tradition and there are lessons to be learnt from this area.

As in other parts of the world, it is time to treat in situ species conservation in the Mediterranean as a serious issue that demands an informed, coherent and costed strategy.

Plant micro-reserves in the Valencian Region (Spain): Are we achieving the expected results? *

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The plant micro-reserves (PMR) are a specific designation of protected sites for *in situ* protection of selected plots of native vegetation, proposed by 1990 in the Valencian Community (Spain) and developed since 1994 thanks to an *ad hoc* legislation (Valencian Decree 218/1994). The Valencian PMRs are protected sites up to 20 ha housing endemic, rare or threatened plant species, set up on public lands, or proposed by engaged landowners on their properties. The design, protection and management are carried out by the regional government (Generalitat Valenciana).

After almost 20 years since the set up of the PMRs network, it is time for an assessment of its effectiveness in order to protect endangered and endemic species, boost knowledge and research and promote recovery of threatened species.

The first objective of the PMRs since 1994 until 2009 was to set up a network focused on the endemic species, in order to facilitate its study and regular census by the Valencian botanists. Due to this reason, lots of PMRs were devoted to protect selected sites holding endemic, but not endangered species. Currently, the network holds populations for 270 endemic taxa (74% of the Spanish endemics found in the region). In most cases the sites selected held the best populations known for those species, so they did not need additional practices of active conservation. Although its effectiveness to ensure the passive conservation, the network failed to achieve its main pursued goal –to obtain an overview on the long term changes in the Valencian flora, through the population data of the PMR target species-, due to the lack of interest of the botanical community to develop a global monitoring of plant populations.

As a result of the approval of the new Valencian Decree of Endangered Flora in 2009, the goals for the PMR network have changed, and the active conservation of threatened species -103, often non endemic plants- was formally proposed as a major goal. For this purpose, the current PMRs are less functional as initially expected, due that only the 60% of the threatened species have been 'captured' by the network. The active conservation tasks for the most endangered species, as proposed in the current drafts of plant recovery plans, often should be developed out of the PMRs –i.e. for the creation of new safe populations. Some directives to encompass the recovery plans and the PMR network should be drafted, in order to improve the role of these protected sites.

*The actions herein reported have been developed thanks to the economic support of the European Commission since 19938 through LIFE projects, and agricultural/regional funds.

Translocation guidelines for wild flora in Italy from the Italian Ministry of Environment (MATTM)

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Nowadays, many wild plant and animal species are at the brink of extinction both globally or locally. Following the 2011 IUCN Red List of the European Union and Italian Red List (MATTM, 2013), about 25% of the considered plant species are threatened with extinction (CR, EN, VU). Species extinction rate have been increasing in the last century as a consequence of human-induced activities, that resulted mostly in habitat destruction and change of land use. Moreover, climate changes start to be quite effective on plant life in cold areas like mountains, mostly in the last two decades. These threats are active in Europe, but poorly investigated, especially for plants. The "Italian Strategy for Biodiversity" (2010), recognizes, among the main threats to biodiversity, the change of the traditional agricultural practices, especially in mountain areas. International strategies and conventions highlight the necessity for urgent conservation actions aimed to halt the loss of biodiversity and to preserve the ecosystemic functions for the human wellness. The best way to conserve species is represented by *in situ* conservation actions with the aim to save wild populations. However, the native habitats are often totally compromised and unable to support the species. As a consequence, new integrated *in situ* and *ex situ* conservation practices have been developed in the field of Conservation Biology. Among them, translocation, including population reinforcements, reintroductions and conservation introductions, are the most important. In Italy in 2013 are published the "Guidelines for the Translocation of Wild Plant species" (http://www.naturaitalia.it/home_it/biodiversita/conservare-la-biodiversita/tut-eco-sister.html?p=9), that are the results of about 20 years researches and practical experiences, focused on the amelioration of translocation techniques. Plant translocations are high risk options with high rate of failure, that can be reduced through the application of rigorous protocols and the development of *ad hoc* thecniques. The publication is a synthesis of the newest knowledge in the field of translocations, from a national and global point of view.

Plant micro-reserves in Bulgaria: the beginning of the initiative and future perspectives

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Plant micro-reserves are small protected areas of less than 20 ha each, functioning in a network and aiming at preservation of endangered plant species. The concept of plant micro-reserves was first launched in the Community of Valencia, Spain in 1990-ties and since then it has been applied in a few other European countries. In Bulgaria this innovative approach for plant conservation started in 2010 with the beginning of a LIFE+ project '*A pilot network of small protected sites for plant species in Bulgaria using the plant micro-reserve model*' (2010–2014). The project is implemented by the Institute of Biodiversity and Ecosystem Research in partnership with the Ministry of Environment and Water. It focuses on 47 species of high conservation concern – 44 vascular plants and 3 bryophytes, located in 61 sites throughout the country. Selected are only species whose populations have been situated outside protected areas and for which any protection measures have not been taken yet. A number of endemics are included, such as *Achillea thracica, Anthemis argyrophylla, Astragalus thracicus, Centaurea wagenitziana, Lathyrus pancicii, Ranunculus stojanovii, Verbascum anisophyllum, Verbascum tzar-borisii*. So far 48 protected sites with a total area of 888.07 ha have been legally designated and other 13 are under designation procedures. For conservation of the species and their habitats a number of conservation activities have been taken: elaboration of a long-term monitoring plan for each species and regular monitoring of its populations in permanent plots, development of action plans, *in situ* and *ex situ* conservation activities, information campaigns to raise public awareness on plant conservation issues. A special database has been designed to organise all data about the populations of the species and their habitats. *In situ* actions involve habitat improvement and management, reducing the populations of competing species, regular site control for eliminating or minimising any disturbance threatening the species. Case studies from the project and the future perspectives of the national network of plant micro-reserves will be presented and discussed.

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Poster presentations / Demonstrations

Phylogenetic diversity and genome sizes of *Astragalus* (*Fabaceae*) in the Lebanon: biogeographical crossroad

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The Lebanese mountain range is an important zone of plant species richness and endemism where the genus *Astragalus* constitutes a principal component of plant biodiversity. Most of endemic *Astragalus* taxa, living in mountains and arid zones of Mounts Lebanon and Anti-Lebanon, are characterized by a cushion, spiny vegetative form, named "tragacanthic", which is a remarkable example of vegetative convergence evolution. Because of difficulties in determination, taxonomic uncertainties, and discrepancy in the number of taxa listed according to authors, new data are hardly needed to improve systematics of *Astragalus* and to investigate the role of the Lebanese mountain range as refugia of biodiversity. Before this study only two values on the genome size of *Astragalus* were reported in the literature and no previous molecular studies has been carried out on *Astragalus* genus from Lebanon. We examined the utility of rDNA ITS molecular markers to distinguish *Astragalus* species of Lebanese mountain range and the variation of their genome size. The main results revealed a striking diversity in Lebanese *Astragalus* species with the emphasis of a huge variation of genome sizes, an important inter-specific chromosome polymorphism and the existence of a high phylogenetic diversity. The strict endemic species of the Lebanese mountains are positioned throughout the phylogeny. These results confirm that the Lebanon and Anti-Lebanon Mounts constitutes a third diversity center for Astragalus and that high altitude areas are an important refugia of plant biodiversity despite human centuries old exploitation.

Revalorisation d'une essence endémique: le sapin de Numidie (*Abies numidica*)

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La région du Maghreb comprend, dans le Nord-Ouest de l'Afrique, cinq pays qui bordent l'océan Atlantique (Mauritanie, Maroc) et la mer Méditerranée (Maroc, Algérie, Tunisie, Libye). Considérant la gestion locale de la biodiversité agricole, on distingue successivement quatre grands types de milieux : la région côtière tempérée, les zones montagneuses, la steppe couvrant les hautes plaines, et les oasis du désert du Sahara. Ces milieux abritent une flore riche deplus de 4000 espèces vasculaires dont 20% endémiques, composante très typée de la biodiversité en particulier pour les mécanismes adaptatifs à l'aridité.

L'Algérie dispose d'un ensemble d'espèces naturelles et cultivées à gamme phytogénétique importante et variée.

Ces ressources représentent tout d'abord un patrimoine phytogénétique de très grande importance vue leur mode de répartition spatiale et leur rôle dans l'équilibre écologique. Elles constituent aussi un véritable patrimoine culturel du fait de leur endémisme et des productions spécifiques (produits de terroir à saveur et à goût particulier) auxquelles, elles donnent naissance.

La biodiversité dont nous avons hérité en Algérie, a subi une érosion pour des raisons naturelles, cas des variations climatiques, ayant résulté dans le confinement de certaines espèces dans des habitats refuges (montagnes, littoral, steppe, désert, etc.) et anthropiques.

Sur le plan forestier, cette biodiversité inclut des espèces d'intérêt national mais aussi international, cas du sapin de Numidie (*Abies numidica*) aux Babors, qui fait l'objet de notre travail.

Anatomical studies on *Alchemilla mollis* (Buser) Rothm. and *A. hirsutiflora* (Buser) Rothm. native to Turkey

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In this study, the anatomical characteristics of the leaves, stems and petiols of the *Alchemilla mollis* (Buser) Rothm. and *A. hirsutiflora* (Buser) Rothm. (endemic) are reported for these species naturally distributed from different parts of Turkey (Davis P.H. 1972: Flora of Turkey and the East Aegean Islands, 4: 81-106). This genus, known locally as "aslanpençesi", "yıldıznişanı", "gürlevik", is represented by 82 species in Turkey (Davis 1972; Guner A. 2012: A Checklist of the Flora of Turkey (Vascular Plants): 791-794.). Microscopic views of the transverse and surface sections from leaves, stems and petiols of each species were examined and described in detail and supported by photographs. The genus *Alchemilla* is well-known for its taxonomic complexity (Violeta B. 2009. Unıv. Dın Craıova 14:431-436). The result revealed a number of taxonomically important characters trichome types, stomata positions, mesophyll types, crystals location and vascular bundle shape. Besides, both of species were identified tannin sacs in pith of stem in cross section. Starch grains are abundant in parenchyma which is upper cell of endodermis in general. There have been a few anatomical reports on the *Alchemilla* species. However, it has not been obtained on these species (Metcalfe C.R., Chalk L. 1968. Anatomy of the Dicotyledones, 1: 539- 543; Violeta B. 2011. Ann. Univ. Craiova Agric., Montan., Cadastre Ser., 41(2): 42-46, 55-58, 59-65).

Biosystematic study on *Centaurea kamciensis* (*Asteraceae*)

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Centaurea kamciensis Kočev & S.P. Gančev (*Asteraceae*) is a Bulgarian endemic with very local distribution at the south border of Northeast Bulgaria floristic region, included in the first edition of the Bulgarian Red Data Book. For more than 40 years the species has been known only by its type gathering in Prisovit locality near Asparuhovo village, Dalgopol Municipality (SOM 87520!). In 2012 it was "re-discovered" close to the *locus classicus*, on cliffs at Chudnite Skali monument, near the same village Asparuhovo. *C. kamciensis* belongs to sect. *Lepteranthus* DC. and its closest relative is *C. kerneriana* Janka, also a Bulgarian endemic from Stara planina (Central) and Rila Mts floristic regions. The current research provides data about the morphology (incl. pollen morphology), karyology, genome size, ecology and population status of *C. kamciensis* from the currently known population and its relative species, *C. kerneriana* from two populations (Rai chalet and Golyam Kademliya peak, Stara planina Mt.). Among the most important distinctive morphological features are the shape and color of the leaves, the size and shape of the capitula, the length of the appendages and the number of the cilia of the appendages. The pollen grains are of Wagenitz's Jacea-type, spheroidal, with the correlation of the polar axis to the equatorial diameter as 1.12. The exine sculpture is microechinate. Both species are diploid, with $2n = 22$. A comparative study of the genome size (measured by flow cytometry) shows stable differences between the 1C-values of the studied populations: *C. kamciensis* 0.999 pg; *C. kerneriana* from Rai chalet 1.055 pg, and from Golyam Kademliya peak 1.129 pg, that could be explained with the processes of local speciation in the group. The territory of Bulgaria falls in one of the main centers of origin and distribution of *Centaurea* sect. *Lepteranthus* – 67% of the taxa are endemics. The only known population of *C. kamciensis* inhabits vertical cliffs with scarce vegetation and numbers about 40 individuals. The species should be regarded as Critically Endangered according to the IUCN criteria.

Cytogenetical test to predict the vigour potential in brassica seeds under long-term storage

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Preservation of intraspecific diversity in seed banks is a common strategy to frontier the loss of biodiversity, however long-term storage inevitably results in the loss of a certain percentage of seeds, therefore causing the genetic erosion of a seed collection. For this reason seed quality monitoring is of outstanding importance to ensure that the regenerated genetic material is representative of the endemic natural diversity once reintroduced in the environment, as well as to preserve the genetic biodiversity of species economically relevant for modern agriculture. Ageing amplification tests, in which seeds undergo osmotic stresses, enable to detect little differences in the vigour of seeds with high germination percentage (%G) thereby allowing to predict precociously damages induced by long-term storage.

In the present research the quality of *Brassica villosa* subsp. *drepanensis* seeds stored in a genebank (at -20°C for sixteen years) was compared to seeds at harvest (control) by combining %G and mean germination time (MGT) measurements, ageing amplification tests and cytogenetic changes in primary roots.

Comparison of %G and MGT between control and stored seeds showed no significant differences. Conversely ageing amplification tests where a saline shock (NaCl -0.9 MPa) was given for six hours to control seeds or after storage, evidenced no significant influence on %G of control seeds, but significantly reduced the % G of stored seeds. The treatment with 1.4 MPa osmotic potential significantly reduced %G of control and stored seeds (50 and 4% respectively).

Cytogenetic analysis clearly showed significant reductions of the mitotic index, the appearance of c – metaphases, chromosomes laggings and bridges in stored seeds in respect to control seeds germinated in water. While the treatment with -0.9 MPa osmotic potential had no significant effects in both groups, the treatment with -1.4 MPa osmotic potential had inhibitory effects in root apices of control seeds and completely prevented cell division in stored ones.

The results presented in this study indicate that despite a comparable germinative response of seeds, long-term storage induces cytogenetical damages and increase susceptibility to salt stress, therefore lowering the seed quality.

We suggest the use of the ageing amplification test and cytogenetical parameters as more sensitive, reliable and inexpensive methods compared to germination percentage tests, allowing an early prediction of genetic erosion events in germplasm banks and representing a valuable alternative tool for seed producers.

La subéraie de la Numidie orientale: une source de biodiversité

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La subéraie algérienne subit une anthropisation accrue due à un certain nombre de facteurs parmi lesquels: les labours et mise en culture impliquant la destruction des écotones; la reforestation irréfléchie avec des essences exogènes dont l'impact sur la végétation autochtone n'a pas été étudié au préalable; les incendies répétés et l'élevage extensif.

L'anthropisation liée à certaines activités humaines remonte à 7 000 à 8 000 ans, et tout le long de ces longues années, la subéraie a acquis des mécanismes d'adaptations aux différents aléas ce qui a engendré une biodiversité très intéressante.

Le but de cette étude est d'évaluer la biodiversité dans des subéraies se développant sur différents substrats. Des relevés floristiques ont été prélevés dans 165 stations caractérisées par des facteurs mésologiques divers.

L'étude nous a permis de constater que malgré toutes les contraintes précitées la subéraie continue à présenter une source de biodiversité qui participe au maintien de l'équilibre écologique dans la Numidie orientale.

Malheureusement, ces derniers temps, d'autres facteurs de déstabilisation viennent s'ajouter à ceux déjà présents, notamment le changement climatique. Ce dernier aura un impact certain sur la biodiversité au niveau du cortège floristique du chêne liège.

Phylogeny of alectorioid lichens (*Parmeliaceae*, *Lecanoromycetes*) with special emphasis on *Bryoria* sect. *Implexae*

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The alectorioid lichens form a morphological group in *Parmeliaceae* the phylogenetic relationships of wich are still unclear; the concept we are using here includes *Alectoria*, *Bryocaulon*, *Bryoria*, *Nodobryoria*, *Oropogon*, *Pseudephebe* and *Sulcaria*. The species are fruticose, from erect to pendent and with cylindrical thalli, a hard cortex, and a lax medulla. Most species in the group usually lack sexual structures and morphological variability is scarce. Moreover, in some groups, as in *Bryoria*, species have high intraspecific variability and there are not uncomonly cases where one single specimen shows intermediate characters of several species. We are focusing this investigation in the section *Implexae* of this genus including *Bryoria chalybeiformis, B. capillaris, B. glabra, B. implexa, B. fuscescens, B. lanestris* and *B. subcana*.

In this contribution we present a multigenic phylogenetic reconstruction using ITS, LSU nrDNA, SSU mtDNA, and single copy protein coding gene *MCM7* of more than 50 species.

Preliminary results reveal: (a) the alectorioid lichens are split into two independent lineages, (b) the genera are monophyletic, and (c) within *Bryoria* sect *Implexae* the most common European taxa are conspecific.

Identification de l'acacia australien envahissant dans le parc Parc National d'El Kala en Algérie: *Acacia mearnsii* De Wild.

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Le genre *Acacia* appartient à la famille des légumineuses (*Fabaceae*) (sous-famille des Mimosoïdées) et renferme plus de 1380 espèces distribuées dans de nombreuses régions dans le monde mais majoritairement en Australie. La taxonomie et la description botanique de certaines espèces d'acacias sont très complexes du fait de grandes similarités morphologiques comme c'est le cas entre les deux espèces *Acacia mearnsii* De Wild. et *Acacia decurrens* Willd. Ces deux arbres australiens sont très proches morphologiquement et appartiennent à la section *Botrycephaleae* du sous-genre *Phyllodineae*. Cette section apparaît peu spécialisée et présente nombreux caractères ancestraux. La nomenclature de l'espèce *A. mearnsii* a été modifiée plusieurs fois et prête à confusion. Ainsi, plusieurs variétés ont été distinguées au sein de l'espèce *A. decurrens*: *A. decurrens* var. *dealbata*, *A. decurrens* var. *lanigera*, *A. decurrens* var. *mollis*. Cette variété *Acacia decurrens* var. *mollis* (ou *mollissima*) n'a été renommée *Acacia mearnsii* qu'en 1949. En 1970, une Fabacée d'origine australienne a été introduite dans le Parc National d'El Kala au Nord-est de l'Algérie. Cette espèce, depuis lors devenue invasive, est nommée par les gestionnaires et les forestiers sous les noms d'*A. decurrens* ou d'*A. dealbata*. La présente étude consiste en la vérification de l'identité de cette espèce qui est à l'origine d'énormes dégâts dans le parc.

Pour ce faire, nous avons choisi comme marqueur la région *trn*K/ *mat*K de l'ADN chloroplastique en utilisant les amorces spécifiques *trn*K-3914/ Ac283R ciblées pour l'identification de certains acacias. Pour confirmer les résultats obtenus, nous avons également analysé la région ITS de l'ADN ribosomique grâce aux amorces 26S /S3.

Nos résultats mettent en évidence, que ce soit par séquençage avec le marqueur moléculaire *trn*K ou par séquençage de l'ITS de l'ADNr, un taux de similarité en faveur de l'espèce *A. mearnsii*. De façon complémentaire à l'analyse moléculaire, des feuilles et des gousses ont été confrontées à celles de l'herbier du Cirad de La Réunion. La vérification botanique confirme qu'*Acacia mearnsii* est bien l'espèce invasive du Parc national d'El-Kala.

Visualization of flora and vegetation of Afghanistan

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Afghanistan exhibits a mediterranean but rather continental climate. The very diverse geology and geomorphology provide special conditions for a high biodiversity, even more since Afghanistan is located at the crossroad of various floristic provinces.

Our project is an augmented checklist of all vascular plant species of Afghanistan. It is dealing with a comprehensive overview of the species number and endemism of the plant taxa in Afghanistan. It is the first augmented check list of the Afghan flora based mainly on the Flora Iranica as a preliminary source and many newer publications, as well as own observations. The project is partly a follow-on from the earlier Field Guide Afghanistan (Breckle & Rafiqpoor 2010. Field Guide Afghanistan- Flora and Vegetation.Bonn-Manama-New York-Florianopolis.), which visualizes about 2000 coloured photographs covering c. 1200 species of the Afghan flora. In addition, the Field Guide provides extensive chapters on all aspects of the natural history of Afghanistan.

Providing both monographs to the scientific community, a more reliable answer to the question: "How many vascular plant species do we have in Afghanistan?" can be given based on the information now at hand. The inventory coverage of vascular plants in Afghanistan is, in a SWAsiatic context, rather complete. It counts about 5000 species, from which c. 25% are endemic. We use an alphabetical and tabular arrangement. This allows the taxonomist to keep his notions of relationship fluid, and makes it more user-friendly for non-specialists. This checklist includes much more information than a mere list of names. Especially distributions maps for almost each recorded taxon make the project useful for many purposes: it enables us to quickly have a better survey of species numbers in plant families and genera, as well as their geography. It may serve to indicate gaps of knowledge in some taxa or areas. It can also serve as a tool to check the nomenclatural history of naming plant species of the country, as well as many other applications. An important function of the project in future can be the use in threatened species assessments and even more for conservation management.

Breckle, S.-W., Hedge, I.C., Rafiqpoor, M.D. 2013: Vascular plants of Afghanistan – an augmented checklist. c.600pp. ISBN xxx, about 150 photographs, hardcover, in preparation.

Glume and lemma micromorphology of the genus *Aegilops* (*Poaceae*) in Turkey

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The genus *Aegilops* L. consists of more than 20 species and constitutes the secondary gene pool for cultivated wheats (van Slageren, 1994; Cabi & Doğan, 2009). Species in the genus *Aegilops* are distributed in the South-West and Central Asia and throughout the Mediterranean basin. In Turkey the genus is represented with 17 species.

Micromorphological characters of floral bracts in grasses have been used to assess systematic relationships, as well as evolutionary trends. In this study micromorphological characters of glume and lemma were studied for 13 species in the genus based on scanning electron microscopy. Samples were obtained from herbarium specimens gathered from the field as a result of revision of tribe *Triticeae* Dumort. in Turkey.

The main objective of this study is to shed the detailed diagnostic characteristics of this genus including its glume and lemma micromorphological features. Structural features of glume and lemma epidermises were investigated, including macrohairs, prickles, shape of silica bodies, long cells and stomata.

Results of the study showed that macrohairs are taxa specific, i.e. *Ae. juvenalis* (Thell.) Eig, *Ae. crassa* Boiss., *Ae. vavilovii* (Zhuk.) Chennav. and *Ae. neglecta* Req. ex Bertol. have addpresed, antrorsely pointed macrohairs up to 1mm in length. Prickles are present in all studied taxa, 150-200 μm in length. Crown cells are abundant on the glume and lemma surfaces, 40-60 μm in length. Silica bodies are elliptic, rounded, reniform and semicircular. Long cells are dominant element on the epidemises of glumes and lemmas, rectangular in shape with strongly sinuous and more or less raised walls. A detailed discussion about the value of epidermal characteristics in systematic manner is also presented.

The Yves Rocher Foundation actions for conservation of nature and supports to botany

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The Yves Rocher Foundation for the protection of nature was created in 1991 and placed under the aegis of the Institute of France in 2001.

The foundation supports local and global nature-preservation, solidarity and environmental-education initiatives in more than 50 countries worldwide.

The foundation is working each days to create a greener world through several main actions:

The Women of Earth Award,

The Plant for the Planet operation with a program of 50 millions of trees, with a project in Sicily,

The support to Botany knowledge, in historical and botanical gardens, in books publications and since more 10 years Tela-Botanica French network, which is presenting a free electronic database on flora of North Africa in this congress.

Reproductive success in the herkogamous spring geophyte *Crocus etruscus* (*Iridaceae*)

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Spatial separation of male and female reproductive structures in hermaphrodite flowers is a widespread floral trait that has traditionally been viewed as an adaptation that reduces the likelihood of self-pollination.

The genus *Crocus* L. (*Iridaceae*), consists of about 100 species occurring from western Europe to western China. In Italy, 15 species of *Crocus* occur, and five of them are endemic to the country. In particular, *Crocus etruscus* Parl. is endemic to Central Tuscany and shows a continuous variation in herkogamy levels, spanning from stigma located at higher to lower position than anthers. Fruits ripe at soil level and contain about 30 dormant seeds.

To quantify the relationships between sexual organ position and plant reproductive fitness, we analysed the effect of different breeding systems and of herkogamy degree on female reproductive success. We performed hand pollination experiments involving spontaneous and forced self-pollination of short-styled and long-styled flowers and also all possible cross-pollinations. We also studied the reproductive success of 50 flowers spanning a gradient of separation between anthers and stigma under open pollination conditions in the natural habitat.

Logistic regressions indicated a significant effects of breeding systems on fruit and seed set and we conclude that *C. etruscus* is self-incompatible (Self Incompatibility Index sensu Lloyd & Schoen; SCI = 0.3). Moreover, linear regression showed a significant negative effect of herkogamy on seed set of open-pollinated flowers. Thus, the species avoids self-interference by self-incompatibility, but interestingly shows also a certain degree of spatial separation of male and female reproductive structures within the same flower.

The vascular flora of the Uria river basin (Calabria, S Italy): first insights

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Calabria, the southernmost continental region of Italy, claims an intricate geological and biological history. The vascular flora counts around 3,000 taxa and many endemics. Part of this territory is botanically poorly known, such as Presila, an hilly-mountain unprotected area situated between the Sila Massif and the Ionian Sea. It presents high bioclimate and substrate diversity, peculiar geomorphology (faults, gorges, etc.), significant altitude variation (0-1,300 m a.s.l.). These characteristics support the wide variety of habitats and floristic richness of the area, hitherto, more supposed than scientifically established. Aim of this work, as part of a wider landscape survey, is to improve the botanical knowledge of part of Presila, the Uria River basin and surrounding areas.

Around 3,000 herbarium specimens have been collected, dried, identified. Floristic, ecological and geographical data have been merged into a GIS database and used to perform statistical elaboration regarding the number of taxa found, families, genera and to analyze the chorological and biological spectra.

About 400 floristic sampling have been made, for resulting 835 species, 435 genera, 103 families. The most represented families are *Asteraceae* (113 species), *Fabaceae* (85), *Poaceae* (85), *Apiaceae* (40), *Lamiaceae* (37). Coherently with the Mediterranean climate the biological spectrum is dominated by Therophytes (36%), Hemycriptophytes (34%), then Phanerophytes (13%) and Geophytes (10%). The chorological spectrum showed the prevalence of Steno-Mediterranean (22%) and Euri-Mediterranean (21%) species, followed by Paleotemperate (8%). Conspicuous the occurrence of Exotic species (4%), although only a few showed invasiveness. Special attention deserve the endemic species (5%) among which recently found are *Stipa austroitalica* and *Helianthemum jonium* (the latter first reported for Calabria). However, the most important finding in the area is a new taxon belonging to the cycle of *Centaurea deusta* named *C. calabra* (Caruso & al. 2013. Pl. Biosyst. *in press*.).

If further investigation will be necessary to deliver exhaustive information on its floristic and taxonomic richness, the occurrence of endemic/rare species and the ongoing mapping of priority habitats sensu Habitats Directive 92/43/EEC (such as riparian forests with Platanus orientalis) will hopefully support the long term conservation of the area.

The *Centaurea deusta* group (*Asteraceae*) in Italy

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Tenore described *Centaurea deusta* (Tenore 1811. Prodromo della Flora Napolitana, 51. Neapoli). As his knowledge improved thanks to specimens from different regions of the former Naples Kingdom, he adapted his definition of this species and its taxonomical range describing two varieties (Tenore 1920. Flora Napolitana, 2: 266. Neapoli) and later even up to four (Tenore 1831. Sylloge plantarum vascularium florae Neapolitanae hucusque detectarum. Neapoli). However, no records of *C. deusta* from Calabria are reported in Tenore's work, despite had been meanwhile published a work reporting some Calabrian stands of this taxon (Gussone 1826. Plantae Rariores Quas in Itinere per oras Jonii ac Adriatici Maris e per Regionis Samnii ac Aprutii. Neapoli). Anyway, several taxa belonging to the *Centaurea deusta* group have been described in the last decades in Calabria: *C. sarfattiana* (Brullo & al. 2004. Bot. Jahrb. Syst. 125(4): 453-488), *C. aspromontana, C. ionica, C. pentadactyli, C. scillae* (Brullo & al. 2001. La vegetazione dell'Aspromonte. Reggio Calabria), *C. poeltiana* (Puntillo 1996. Fl Medit 6: 219-222), *C. calabra* (Caruso & al. 2013. Pl. Biosystems *in press*). The richness of taxa belonging to *C. deusta* group demonstrates Calabria, still today one of the less botanically investigated regions of Italy, to be one center of diversification of *Centaurea* sect. *Phalolepis* in the Mediterranean.

First taxonomical and distributive data for Italy, based on both literature and original records of *C. deusta* s.l., are here presented, as part of an ongoing project. Critical mapping is also aimed to steer future efforts of phytogeographical and taxonomical investigation still deserving *C. deusta* s.l. especially in southern Italy.

Flora Critica d'Italia: A synopsis of *Boraginaceae* subfam. *Hydrophylloideae* and *Heliotropioideae*

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According to the last APG treatment (APG 2009. Bot. J. Linn. Soc. 161: 105-121), *Boraginaceae* s.l. is an average-size family including some 2.700 species belonging to c. 130 genera subdivided among eight well-distinct subfamilies. Recent phylogenetic evidence, however, showed that each of them represents a well supported monophyletic group that should be treated as a distinct family, together forming the order *Boraginales* (e.g. Ferguson 1998. Syst. Bot. 23(3): 253-268; Weigend & al. 2013. Mol. Phyl. Evol. 68: 604-618.). Three "subfamilies" are represented in Italy by native or allochtonous species: *Boraginoideae*, *Heliotropioideae* and *Hydrophylloideae*.

The number of taxa reported from the Italian territory has gradually increased from 14 genera and 60 species described in the first National Flora (Bertoloni 1835-1836. Flora Italica 2, Bononia), to 29 genera and 115 species reported in the most recent Checklist (Conti & al. 2005. An annotated checklist of the italian vascular Flora. Roma). More than 90% of the taxa are included in the Boraginoideae, with less than 10% belonging to the other two, most "atypical" groups.

As a first contribution to the taxonomic treatment of the whole family for Flora Critica d'Italia, a synopsis of *Boraginaceae* subfam. *Hydrophylloideae* and *Heliotropioideae* was prepared, primarily based on a detailed literature survey and on the critical study of herbarium material conserved in most of the Italian collections, also integrated by observations on natural populations. All the relevant floristic reports were examined and all the specific names of taxa reported from the national territory were typified, as well as a number of infraspecific ones. A synthesis of this work is presented here.

In total, seven taxa were recognised. Only three of them in the genus *Heliotropium* (*Heliotropioideae*) are autochtonous (*H. europaeum, H. suaveolens* subsp. *bocconei* and *H. supinum*), while two other congeners (*H. amplexicaule* and *H. curassavicum*) are exotic species introduced from the Americas. A neotype was designated for *H. dolosum* showing its substantial identity with *H. europaeum*; literature reports of *H. arborescens* (= *H. peruvianum*) refer only to cultivated plants.

Similarly, both members of *Hydrophylloideae*, *Phacelia tanacetifolia* and *Wigandia urens* (= *W. caracasana*), are new-world species only represented in Italy by adventitious populations; original material was used for their lectotypification. The latter occurs in Liguria with strikingly different morphotypes, sometimes reported as separate species.

Analytical keys, distribution maps and lists of selected "*specimina visa*" have been prepapred according to the model established by the Editorial Board of Flora Critica d'Italia, as well as original iconographies to help with species identification.

Two Turkish endemic piliferous *Reseda* species, *R. tomentosa* and *R. germanicopolitana*

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Resedaceae is represented by *Reseda* genus which has 6 endemic species (% 27.3) and 9 endemic taxa (% 40.9) and 22 indigenous taxa in Turkey. *Reseda*, containing approximately 65 species worldwide, are widely distributed in the Mediterranean basin. The species of *Reseda* are annual or perennial herbs and occur in limestone soils and arid environments. Species diversity, endemism number and phylogenetic relationships in *Resedaceae* suggest two major centers of differentiation, one in the western Mediterranean and the other in the eastern Mediterranean and southwest Asia.

In this study, morphological characters of two endemic species , *Reseda tomentosa* Boiss. and *Reseda germanicopolitana* Hub.-Mor. are presented. They resemble each other in petal colours, number of carpels, leaves with white villose indumentum and gypsaceous habitat. The used diagnostic characters between these two taxa are leaf shape, sepal persistency, petal shape, number of lobes and length of capsule pedicels.

A new species of *Euphorbia* (*Euphorbiaceae*) from Greece and its phylogenetic placement within *E.* sect. *Patellares*

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The large genus *Euphorbia* L. comprises approximately 54 species in Greece, including members of subgenus *Chamaesyce* Raf. that mostly represent allochthonous species. Some recent collections of *Euphorbia* from southern Greece represent an undescribed species within *E.* sect. *Patellares*. The new species is a perennial plant scarcely woody at base, with entire margins of cauline leaves, connate raylet leaves subtending cyathia, and apparently smooth seeds. Its stems are mostly biennial with cauline leaves strongly dimorphic: those of first-year are obovate to obovate-lanceolate in outline while those of second year orbicular to reniform. The inflorescence is short and lax, developed on 1-4 rays.

Preliminary results of a Bayesian phylogenetic reconstruction within *Euphorbia* sect. *Patellares* based on both ribosomal and chloroplast regions indicate that the affinities of the new species should not be searched within the polymorphic *E. amygdaloides* group represented in Greece by *E. amygdaloides* L. and *E. heldreichii* Orph. ex Boiss. Instead, the new species is related to a group of mostly Asiatic taxa (albeit with low posterior probabilities at present) including *E. kotschyana* Fenzl, *E. davisii* M.S. Khan and *E. oblongifolia* (K. Koch) K. Koch. The molecular results are in accordance with morphological evidence. *Euphorbia davisii* from the Taurus Mountains (Turkey) appears to be the closest relative of the new species. From *E. davisii* the Greek species differs in a number of morphological characters of stem, leaves and inflorescence and is separated by a distance of 800-950 km.

The chromosome number of the new species is $2n = 20$. The same number is common in other members of *Euphorbia* sect. *Patellares*.

The resurrection of *Paracaryum ponticum* (C. Koch) Boiss. (*Boraginaceae*) from Turkey and its new synonym, *P. artvinense* R. R. Mill

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Turkish endemic species *Paracaryum ponticum* is re-evaluated as a real species on the basis of examining the type material, a large quantity of specimens and the relevant literature. *Paracaryum ponticum* was first collected and described as *Omphalodes pontica* by C. Koch in 1849. It was then transferred to the genus *Paracaryum* by Boissier in 1875. Over the years *P. ponticum* was placed in the synonymy of *P. leptophyllum* (A. DC.) Boiss. but differs from it by the stem spreading hirsute at the base (not adpressed hairy), basal leaves 3-12 mm wide (not 1-2 mm), corolla tube c. 1 mm long (not 1.5-2.8 mm) and nutlet wings with involute denticulate margine (not patent). In addition, *P. artvinense* R.R. Mill which is described in 1977 is proposed as a new synonym of *P. ponticum*.

Paracaryum ponticum, *P. leptophyllum* and *P. artvinense* occur in the same area, northeastern Turkey. After examinated of these three species during a taxonomical revision of *Paracaryum* in Turkey, *P. ponticum* is accepted as a real species and *P. artvinense* reduced to synonym of *P. ponticum*.

The threatened category of *P. ponticum* is proposed Endangered (EN) because of restricted distribution area (less than 500 km^2), rarely and under destroying scree habitat, not abundant populations.

The identification key, morphological discussion, distribution map and photograps of Paracaryum species which occur in northeastern of Turkey are given.

About the Flora and Vegetation of the Botanic Garden of Coimbra (Portugal)

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Within a three years floristic project, funded by the Foundation Calouste Gulbenkian, I have been studying the vascular flora of the Botanic Garden of Coimbra (centre of Portugal). This tiny area (about 0.135 km^2), situated north of the river Mondego, very close to its right margin, ranges from 20 to 90 m above the sea level and is totally included inside the city of Coimbra, near the old University (municipality of Coimbra, district of Coimbra, province of Beira Litoral).

Arenitic rocks are the dominant rocks, but there are also present many calcareous walls, with a rich chasmophytic vegetation, including the very rare species *Micromeria juliana* and *Verbascum levanticum*.

Inside this ancient garden –originally from the seventeenth century (1774), destined to the cultivation of medicinal plants–, it's possible to find spontaneous and naturalised vegetation from several classes of vegetation: *Adiantetea*: hidrophilic chasmophyte fern, seed plant and bryophyte communities (with *Adiantum capillus-veneris*, etc.) *Anomodonto-Polypodietea*: epiphytic and comophytic communities dominated by rhizomatous ferns, bryophytes and seed plants (*Frullania tamarisci, Polypodium interjectum, Selaginella denticulata, Umbilicus rupestris*); *Parietarietea*: urban anthropogenic wall chasmophyte nitrophilous communities (with plants as *Anredera cordifolia, Arenaria leptoclados, Asplenium ceterach, Asplenium trichomanes* subsp. *quadrivalens*, *Cymbalaria muralis, Erigeron karwinskianus, Ficus carica, Hyoscyamus albus, Micromeria juliana, Parietaria judaica, Trachelium caeruleum, Umbilicus rupestris, Verbascum levanticum*, etc.); *Stellarietea mediae*: annual ephemeral weed, nitrophilous and seminitrophilous communities of synanthropic vegetation (with many species as *Anagallis arvensis, Arabidopsis thaliana, Avena barbata, Calendula arvensis, Capsella bursa-pastoris, Catapodium rigidum, Cerastium glomeratum, Chenopodium album, Digitaria sanguinalis, Ecballium elaterium, Erigeron canadensis, Erigeron sumatrensis, Euphorbia peplus, Fumaria muralis, Fumaria officinalis, Galactites tomentosus, Galinsoga parviflora, Geranium molle, Hibiscus trionum, Hirschfeldia incana, Hordeum murinum, Kickxia spuria* subsp. *integrifolia, Lamium amplexicaule, Lamium purpureum, Malva hispanica, Medicago lupulina, Medicago minima, Medicago polymorpha, Misopates orontium, Papaver rhoeas, Portulaca oleracea, Rostraria cristata, Rumex pulcher* subsp. *woodsii, Senecio vulgaris, Setaria verticillata, Silene gallica, Stellaria media, Solanum nigrum, Sonchus oleraceus, Stellaria media, Trifolium angustifolium, Trifolium scabrum, Veronica arvensis, Veronica persica, Veronica polita, Vicia disperma, Vicia lutea, Vicia sativa*).

An inventory of the vascular flora of the garden is being prepared. More than six thousand species of vascular plants (native, naturalised and cultivated) will be included.

Maleae (*Pyreae*) Tribe in Turkey: An Overview in point of distribution and taxonomy

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The tribe *Maleae* is represented by 12 natural and a few cultivated genera in Turkey. Five of the genera (*Pyrus, Sorbus, Amelanchier, Cotoneaster* and *Crataegus*) are represented by few to several species in the country. The Rest is represented by single species or a few taxa. In terms of endemism any of the genara is not restricted to Turkey. Among them, *Crataegus* is the richest with seven endemic species (7/26).

Distribution pattern of the genera in Turkey have a weak speciation into the phytogeographical regions of Turkey. Beside this, specification into the regions is more prominent in respect of regions and ecological conditions. Due to extensive distribution via birds and other animals which feed on the fruits, their distribution patterns are not clearly restricted.

Pollen morphology of the tribe is basically tricolporate with striate ornamentation and it is helpful in identification at generic level. In addition to the genus *Crataegus*, other genera of the tribe are under study in respect of pollen morphology.

Molecular studies on four chloroplast genes (*trn*G-*trn*S, *rpl*20-*rps*12, *trn*H-*rpl*2, *psb*A-*trn*H) are useful in large scale geographic distribution. But it is limited in small scale and population level. The studies on the SW Asian taxa of Maleae tribe are ongoing for understanding phylogeny of the taxa. An overview of the tribe is given according to the data obtained from actually ongoing studies in the SW Asian samples.

Taxonomic and phylogeographic study of the *Silene italica* group (*Caryophyllaceae*) in the Eastern Mediterranean basin

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A PhD thesis is presently conducted on the taxonomic and phylogeographic study of the *Silene italica* group in the Eastern Mediterranean Basin. This work will complete what has already been done in our lab on the Western Mediterranean species. The *Silene italica* group comprises about 30 species in the Mediterranean Basin, 14 occurring in the eastern part among which 12 are endemic species. The main hotspots of diversity for the latter are Greece and Turkey with seven species in Greece (*S. sieberi, S. cythnia, S. goulimyi, S. spinescens, S. damboldtiana, S. niederi, S. congesta*) and three in Turkey (*S. splendens, S. phrygia, S. ispartensis*). The two remaining species occur in Cyprus (*S. galataea*) and Lebanon (*S. astartes*). Two species have larger distributions: *S. italica* s.l. is found from the Pyrenees to Iran and *S. gigantea* s.l. occurs in all the Balkan Peninsula.

We characterised all the species of the Eastern Mediterranean basin using two chloroplast markers (*psb*A-*trn*H and *trn*S-*trn*G) and many accessions per taxa. The molecular results show that species from the Eastern and Western Mediterranean Basin form two distinct entities indicating the occurrence of two independent speciation events within the group. Moreover every endemic species of the Eastern Basin displays specific chloroplast haplotypes. The haplotype network also shows that two species have a central position between the eastern and western entities: *Silene nemoralis* occurring in Central Europe and *S. damboldtiana*, a poorly known endemic species from the northern Greek mountains. This could indicate that they played a leading role in the diversification process.

From a phylogeographic point of view, species radiation and their extant distribution seem to be related to paleogeographic events that occurred from the Middle Miocene until the end of the glaciation cycles, especially in the Aegean archipelago of Greece. Plausible speciation scenarios taking into account the paleogeographic history of the region are discussed.

Microhabitat selection of *Salicornia fretagii* and *Salicornia perennans* (*Chenopodiaceae*)

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Salicornia freitagii Yaprak & Yurdakulol and *S. perennans* Willd. (*Chenopodiaceae*) are annual halophytic plants with dimorphic seeds. Although they occupy similar habitats around saline lakes, they form pure communities; *S. freitagii* at more saline lower marsh and *S. perennans* at less saline upper marsh. It was aimed to find out the influence of germination characteristics on microhabitat selection.

The optimum germination conditions were found as 12 hours day/night photoperiod with 9˚C night and 22 ˚C day temperatures. The lateral seeds of both species were dormant with less than 40% germination ratio and for breaking down of dormancy cold treatment were found affective. Although they have tolerance for high salinity in their natural habitat, over 200 mM NaCl there was a great decrease in germination ratio. TTC test was applied to the ungerminated seeds after recovery. The dead seed ratio was high for both of the species. The influences of different NaCl concentrations of seed germination were analyzed with SPSS and one-way ANOVA. Increase in NaCl concentration decreased the germination rate and the highest germination ratio for all the trials were found at lateral seeds dormancy of which were broken with cold treatment. There was a statistically important difference between the germination characteristics of the seeds at 200 mM and 400 mM NaCl ($p<0,05$). It was concluded that salinity range between 0-400 mM NaCl is a threshold for germination of these seeds and there should be some extra trials at this range.

A morphological study on the 13 local endemic species of *Allium* (Sect. *Allium*) in Turkey

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Allium L. (*Amaryllidaceae*) is one of the large genera of Monocotyledons, it comprises of more than 800 species in the world and 180 of which grow in Turkey. *Allium* is as an important genus due to its use as food, spice, for amenity and also for medicinal purposes. In the Flora of Turkey it has been classified under 14 sections. Section *Allium* is the largest section of the genus, characterised by the tricuspidate inner filaments. The subject of our study is the morphological investigations of 13 local endemic species in Turkey. For some species the diagnostic characters are not clearly or accurately represented in the Flora of Turkey therefore our first aim was to determine the diognostic characters due to detailed illustrations. Our research is mainly based on the specimens of AEF herbarium. Comprehensive descriptions, habitats, geographical maps and detailed illustrations were provided for each taxon.

Taxonomic entities new to the flora of Tunisia

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Botanical surveys undertaken since more than a decade in the north of the country (Biogeographic regions of Kroumiria [K], Medjerda Valley [VM], Mogods [M] and Northeast of Tunisia [NE]), using various North African and North Mediterranean flora which are based mainly on micro and macro-morphometric measurements through various dichotomous keys, have enumerated more than 1000 plant species. Seventeen (17) taxonomic entities, not listed in the Tunisian flora (Cuénod 1954; Alapetite Pottier 1979, 1981; Le Floc'h & al. 2010; SIFNA 2010-2013) have been identified. These new taxa belonging to different families (*Araceae*, *Asteraceae*, *Euphorbiaceae* and *Orobanchaceae*) are distributed in 12 species, 1 subspecies, 3 varieties and one forma. Some of these taxa possessing rather a North-Mediterranean distribution and linked to the flora of the other Mediterranean side will be cited for the first time in North Africa.

Will be presented and discussed during the intervention, the different taxonomic entities recently inventoried and the current distribution of each of them, on the Tunisian territory.

Endangered Plant species in Tunisia, North Africa and the Mediterranean: what strategy?

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'*Phytorly.db*' (Kchouk & Bari 1996) is an automated Tunisian Flora database set up for curators of Plant Genetic Resources and Plant Biodiversity based on taxa reported by Cuenod (1954) and Pottier-Alapetite (1979 & 1981). Recent updates of Tunisian Flora (Le Floc'H & al. 2010; Nabli 2011) called for a review of *Phytorly.db*.We focused on new issues raised regarding rare and endangered plant species in Tunisia. We propose a collaborative action towards the conservation of threatened species in Tunisia, in North Africa and the Mediterranean.

Morphological studies on *Alchemilla mollis* growing in Turkey

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The genus *Alchemilla* L., which is distributed mainly in the Holarctic but occurs also on the mountains of East and South Africa as well as Madagaskar, South India, Sri Lanka and Java, comprises of more than 1000 species (Uotila & al. 2007. XII OPTIMA Meeting, Pisa, Italy, 10–16 September 2007). In Turkey, the genus is represented by 82 species of which 35 taxa are endemic (Guner 2012. A Checklist of the Flora of Turkey (Vascular Plants), p.791-94; Davis 1972. Flora of Turkey and the East Aegean Islands 4: 81-106). The genus *Alchemilla* with its numerous and variable forms presents an interesting object for taxonomical studies which carried out within this genus are necessary because sometimes the identification of some species is difficult [Ayaz & İnceer 2009. Pak. J. Bot. 41(5): 2093-2096; Violeta 2009. Unıversıtatea Dın Craıova Unıversıty of Craıova, 14: 431-436). The comparision of morphological characteristics between this study and Flora of Turkey related with of *A. mollis* which grown in Kıranardı Kayseri (new location). Morphological properties of various organs of the plant such as stem, leaf and flower were described in detail and supported by photographs and drawings. As a result, these properties were found to be helpful to taxonomic distinguish *Alchemilla* species.

Using DNA barcoding techniques to identify the *Malva* species in Libya, using nrDNA and cpDNA genetic markers

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The approach of DNA barcoding has been used to distinguish and identify the *Malva* species of Libya. This study has been conducted to use official and novel DNA barcode regions tested on herbarium derived DNA samples. Thirty two specimens represent eight *Malva* species were collected from Libyan herbaria (Benghazi University, Omer Mukhtar University and Tripoli University). Amplified by PCR and sequenced, the DNA fragments of regions *rbc*L, *psb*A-*trn*H, and internal transcribed spacer ITS, produce datasets with varying levels of discriminatory power.

Preliminary studies on the genus *Taraxacum* in western Turkey

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The genus *Taraxacum* Wiggers (*Asteraceae*) comprises more than 2500 species, mainly in the Arctic and temperate zones of the N Hemisphere with main diversity in mountains of Eurasia, a few species in temperate regions of the S Hemisphere. According to Richards (1973), Taraxacum have originated in the western Himalayas. The primitive species are confined, largely as relict populations, in montane areas in west and central Asia and the Mediterranean region.

Taraxacum is represented by 54 taxa in Turkey, 19 of them are endemic and grouped into 12 sections (Sect. *Erythrocarpa*, Sect. *Erythrosperma*, Sect. *Leptocephala*, Sect. *Oligantha*, Sect. *Orientalia*, Sect. *Palustria*, Sect. *Rhodotricha*, Sect. *Scariosa*, Sect. *Serotina*, Sect. *Spuria*, Sect. *Vulgaria*).

Štěpánek & Kirschner (2012) mentioned the main features of the complexity, as below:

(i) A low level of structural morphological differentiation; (ii) Coexistence of agamospermy and sexuality; (iii) Complex hybridity; (iv) Common polyploidy; (v) A large number of taxa.

Revisions of sections are presented illegitimate names and taxonomic status, according to recent datas the genus Taraxacum in Flora of Turkey should be retreated. The geographical distribution of sexual and apomictic types is not well known in Turkey. It needs more field study to understand distuributions of taxa.

The taxonomical problems of *Taraxacum* and its status in Turkey will be explained in detail.

Systematics of European and South-East Asian *Zelkova* Taxa

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We analyzed morphometric characteristics of leaves from different types of shoots of four *Zelkova* taxa: *Z. sicula* (species endemic to Sicily, discovered in 1991), *Z. abelicea* (endemic to Crete) and two species originating from the Caucasus region – *Z. carpinifolia* and *Z. hyrcana* (separate species status of the latter is controversial). The genus *Zelkova* was formerly widely spread, and its current disjunct distribution in Europe is the result of the last glaciation. The poster presents a detailed description of leaves of each species and results of basic statistical analysis and multivariate analyzes. Close resemblance was found between the leaves of *Z. hyrcana* and *Z carpinifolia*. *Z. carpinifolia* and *Z. abelicea* are morphologically very different from each other, and leaves of *Z. sicula* morphologically place between the *Z. carpinifolia* and *Z. abelicea*. Also, the two studied populations of *Z. sicula* differ significantly. This study demonstrated significant variations in the morphology of leaves, depending on the type of stem (twig), from which they origin, the location of leaves per shoot (age), and that may lead to misidentification of species based on fossil records of leaves.

Reproductive biology and morphometric study of a species circunmediterranean: *Hypochaeris achyrophorus* (*Asteraceae*)

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When a species present a wide distributional area, the distinct populations use to exhibit phenotypic variations. *Hypochaeris achyrophorus* L. (*Asteraceae, Cichorieae*) is a circumnediterranean species which lives from South Iberian Peninsula to Turkey, including North Africa and most of the Mediterranean islands. This species is an annual herb, self-incompatible and with heterocarpic achenes. We studied 14 populations of *H. achyrophorus* in glasshouse, growing from field collected seeds, to measure several flower parameters: head diameter, and ligule, anther and stigmatic branches length of the florets. We also determined the amount of pollen grains per flower in all the populations. Furthermore we perform a mating system study to test if all the populations present the same self-incompatibility level. The results revealed three main groups, based on floral parameters: the western populations, with bigger floral attributes, and the eastern populations with smaller ones. The third group is composed by the Turkish populations which differed from all the other populations of the species because they showed a very high fruit-set in selfing conditions. All this facts made us to consider *H. achyrophorus* as a clinal species, showing a longitudinal gradient with bigger floral parameters in West Mediterranean basin declining eastwards.

Anatomical Investigations on three varieties of *Thalictrum minus* (*Ranunculaceae*)

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The genus *Thalictrum* L. (*Ranunculaceae*) is represented by nine species, three varieties and eleven taxa in the Flora of Turkey. Three varieties of *T. minus* L. grow in Turkey. These are var. *minus*, var., *majus* (Crantz) Crepin and var. *microphyllum* Boiss. In this study, stem and leaf anatomical features of the plants are described and compared. Some differences have been determined in between varieties. In transverse sections of stems; the shape of stems, presence or absence of trichomes, the number of vascular bundles and in leaf sections; the structure of mesophyll, midrib and upper epidermis walled were determined as significant characters in separations of varieties.

Digitization of the herbarium of František Nábělek's Iter Turcico-Persicum (1909-1910)

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Czech botanist František Nábělek (1884-1965) studied botany at the University of Vienna, Austria, under supervision of Richard von Wettstein. Shortly after finishing his studies he visited SW Asia, where he collected plants from March 1909 until November 1910. During this time he visited the area of the current Egypt, Israel, Palestine, Jordan, Syria, Lebanon, Iraq, Bahrein, Iran and Turkey. Along with Joseph Bornmüller and Heinrich Handel-Mazzetti, Nábělek was one of the most important contributors towards the knowledge of the flora of this area after the publication of Boissier's Flora Orientalis. Results of his studies were published in five parts of his work Iter Turcico-Persicum (Nábělek 1923-1929), where he described four new genera, 78 species, 69 varieties and 38 formas. His extensive herbarium from this area contains 6775 specimens (altogether 4171 collection numbers). The Nábělek collection was first deposited in the herbarium of the Masaryk's University in Brno (currently Czech Republic, BRNU) at the time of his professorship at this University, then it was moved to Bratislava, Slovakia (herbarium SLO), where he organized the Institute of Botany at the University. After Nábělek's retirement his herbarium was first kept in the Arboretum in Mlyňany, Slovakia (MLY), than at the Institute of Botany of the Slovak Academy of Sciences, Bratislava (BAV, later SAV) and for some time also in the Slovak National Museum in Bratislava (BRA). The final place of deposit of this collection is the herbarium SAV. As a result, his type specimens are in literature often referred to be deposited in BRNU, BRA, SLO or BAV, although they are now all in SAV. Some fragments and duplicates are found in E and B. As part of the project of the digitization of herbarium SAV, supported by the Andrew W. Mellon foundation, images of the whole Nábělek's Iter Turcico-Persicum collection will be later this year available via portals of the JSTOR Plant Science, GBIF and BioCASE. Thanks to the support by the CIP-PSP project OpenUp! these images will be also available via portal Europeana. From among the 6775 digitized specimens (including duplicates), 399 represent original material of the names described by Nábělek.

Arum species in Bulgaria – ethnobotany and natural resources

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The common European *Arum maculatum* Mill. is an acknowledged medicinal plant even though not among the most popular ones. In traditional and folk European medicine, *A. maculatum* has been shown to be largely used in kidney stone disease, colitis, liver disease, hyperacidities. Furthermore, the plant has been reported as a very effective remedy against internal bleeding hemorrhoids - a medical condition that has no alternative effective cure except surgery. Moreover, the plant compound Ari Tubera has been clinically demonstrated to have an anti-inflammatory activity in the intestinal and respiratory tract.

Although the uses of the plant are largely acknowledged, little is known about the actual exploitation potential in natural and cultivated conditions. In this study we aim to address this question.

For this, we first gathered information based on a critical revision of the deposited herbarium samples of genus *Arum* L. in the national Bulgarian herbaria (SOM, SOA and SO), which we combined with records from the literature and authors' field collections. Second, we organized this information in a database, which we used to construct UTM-grid maps of the current distribution of the taxa in Bulgaria.

Our herbaria analysis indicated that some vouchers are currently misidentified (*A. italicum* and *A. cylindraceum* identified as *A. maculatum*, and vice-versa). After correction, we can here present a corrected and updated range of the species for Bulgaria.

Our preliminary field survey suggests a more limited potential of natural resources exploitation in Bulgaria, when compared to previous investigations.

Also, the fact that the proper identification is difficult even to specialists could lead to a serious hazard, since plant collectors may confuse species, and thus, may improperly use them.

Based on all mentioned above, it appears that the most appropriate solution for any pharmaceutical exploitation would be rather developing a cultivation program.

Molecular phylogeny of the genus *Sesleria* (*Poaceae*) based on AFLP and plastid DNA

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The main aim of our study was to reconstruct the relationships among populations of the taxonomically intricate genus Sesleria Scop. (Poaceae) based on Amplified Fragment Length Polymorphisms (AFLPs) and plastid DNA (*trn*L-*ndh*F) sequences. We evaluated the genetic structure of the AFLP data using Bayesian approaches (BAPS), Neighbor-Joining (NJ) analysis based on a matrix of Nei-Li genetic distances, Principal Co-ordinate Analysis (PCoA) based on a matrix of Jaccard distances, and discriminant analysis of principal components (DAPC), whereas the plastid sequences were analysed in parsimony, maximum likelihood and Bayesian frameworks.

Reconstruction of relationships among populations based on AFLPs revealed four main clusters with high bootstrap support (BS) between 88 and 100%: I–the outgroup genus *Oreochloa*, II–*Sesleria ovata*, III–*S. leucocephala* and *S. sphaerocephala* and IV–all other *Sesleria* species. *Sesleria ovata* is strongly divergent from other *Sesleria* species, which is in line with some previous classifications treating it as a separate genus *Psilathera*. In the chloroplast tree it is sister to a clade composed of *Oreochloa* and *Sesleria*. *Sesleria sphaerocephala* and *S. leucocephala* together form a monophyletic group very distant from other *Sesleria* species in the AFLP tree, but in the plastid tree they are positioned in the clade with other *Sesleria* species, thus not supporting their classification as a separate (sub)genus *Sesleriella*. Moreover, these two taxa are the only diploid members of the genus *Sesleria* (after excluding *S. ovata*) and were likely involved in the origin of polyploids. Although phylogenetic relationships within group IV (39 taxa) did not receive statistical support, various phenetic analyses revealed two clear groups that almost fully correspond to Deyl's concept of two sections *Argenteae* and *Calcariae*. Lack of bootstrap support in the AFLP NJ analysis and great overlap in PCoA analysis indicate that Deyl's "turmas" (i.e.species swarms) and many species are not monophyletic, which is supported also by the cpDNA analyses. Both datasets suggest that ancient as well as recent hybridization has played an important role in the evolution of polyploid taxa of the genus *Sesleria*.

Insights into the morphological and molecular signals of Californian and Mediterranean populations of *Orthotrichum acuminatum*

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Orthotrichum acuminatum H. Philib. is an epiphytic moss known from the Mediterranean basin. In recent years, some populations of mosses morphologically similar to *O. acuminatum* have been located in southern California, mainly in mountain areas. To establish the identity of these new Californian populations and to test if this is another example of the Madrean-Tethyan disjunction, we have combined a deep morphological study with molecular techniques. Although used plastidial markers (rps4, *trn*L and *atp*B-*rbc*l) do not resolve completely the phylogeny of the studied samples, the obtained results reveal that Californian and Mediterranean samples of *O. acuminatum* constitute a monophyletic group, closely related to *O. speciosum*. However, quantitative characters reveal significant differentiation between Californian and Mediterranean specimens of *O. acuminatum*. Interestingly, the level of morphological differentiation between California and the Mediterranean is similar to the one detected within the Mediterranean basin. We conclude that samples from California belong to *O.acuminatum*, which results to present a remarkable morphological variability within its amphi-atlantic distribution. More analyses are needed to infer the origin of this Madrean-Tethyan disjunction and to resolve the phylogeny of *O. acuminatum* group within the *Orhotrichum* genus.

Karyological study of plants from maritime dunes of W. Peloponnisos

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The importance of maritime sand dunes, as providing home to a multitude of both flora and fauna species has been acknowledged in recent years and thus they are regarded as priority habitats for conservation in the European Union. Sandy beaches in Greece have a very characteristic vegetation of mostly perennial herbs. Most of them have a wide distribution along the Mediterranean and Atlantic coasts. However, just a few local endemic species have been recorded.

As part of the dissertation of the first author, some interesting plants of maritime sands of W. Peloponnisos were karyologically examined (e.g. *Cakile maritima* Scop., *Centaurea seridis* subsp. *sonchifolia* (L.) Greuter, *Dorycnium hirsutum* (L.) Ser., *Pancratium maritimum* L.).

The chromosome number and the karyotype analysis for the studied taxa are given, along with notes on their morphology, ecology and geographical distribution.

Antimicrobial activity of rosemary extracts (*Rosmarinus officinalis*) against four multi-resistant bacterial strains

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Next to the known antibiotics, different aromatic plants are characterized by the synthesis of essential oils (HE) renowned for their antiseptic activity. Among these plants the Rosemary (*Rosmarinus officinalis* L., *Lamiaceae*) occupies an important place.

The extraction of essential oil and its analysis by GC / MS showed that borneol (29.54%), verbenone (12.41%) and beta.-Linalool (11.14%) were the major components.

The aim of this study is to evaluate the antibiotic activity of the essential oil of the Rosemary on four multi-resistant bacterial strains: *Serratia* sp., *Klebsiella oxytoca*, *Klebsiella pneumoniae* productive of carbapenemases (Kpc + and Kpc-). The obtained results are interesting, notably with *Serratia* sp. and Kpc-.

Seasonal variation in total phenolic content of *Dictyopteris polypodioides* (*Dictyotaceae*) and *Cystoseira amentacea* (*Sargassaceae*) from the Sicilian coast

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Phlorotannins are polyphenolic secondary metabolites found in almost all brown algae that function as defense against grazers, pathogens and epiphytes but are also involved in photoprotection mechanisms. These compounds, produced in the Golgi apparatus, are accumulated in cytoplasm, within vesicules called physodes, or bound to the cell wall. The concentration of phlorotannins dif-fers within and between species, shows geographical variations but may be also affected by abiotic or biotic factors. Aims of this study were to evaluate: (i) the temporal variation of total phenolic content in two brown algae, *Dictyopteris polypodioides* and *Cystoseira amentacea*, living respec-tively in the upper infralittoral zone and in the infralittoral fringe, and (ii) its relationship with depth. Thalli of both algae were collected from the north-western coast of Sicily.

Results showed significant differences in total phenol content between *D. polypodioides* and *C. amentacea* with a higher value observed in the first one. Both species showed a seasonal pattern of total phenolic contents and differences in the period of their maximum production were also ob-served between the two species. In *D. polypodioides* the peak was observed during winter and au-tumn (0.95 and 0.81% DW) whereas during spring and summer in *C. amentacea* (0.17 and 0.57% DW). The phenol concentration resulted negatively correlated with the air temperature and the me-dium solar radiation in *D. polypodioides* whereas the correlation was positive in *C. amentacea*.

Even though seaweeds living on the rocky intertidal habitats, subjected to large variations of environmental conditions, should invest more energy in defences, *D. polypodioides* showed a phenolic content higher than *C. amentacea*. Our results suggest that phenol content and seaweed zonation are not interdependent and that sheet-like algae such as *D. polypodioides*, resulting more attractive than thick leathery ones to herbivores, produce larger concentrations of these compounds in order to deter feeding by herbivores.

Morphological comparison analysis of *Juniperus turbinata* from Sicily with populations from different parts of the Western Mediterranean Region

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The Sicilian population of *Juniperus turbinata* Guss. was biometrically compared with three populations of *J. turbinata* from Spain and Greece, which were previously considered as *J. phoenicea* subsp. *turbinata* (Guss.) Nyman, and with two populations of *J. phoenicea* L. from Spain, previously considered as *J. phoenicea* subsp. *phoenicea* (Mazur & al. 2010. Dendrobiology 63: 25-35).

This study has particular relevance due to the fact that although *J. turbinata* had been described by Gussone (1844) from samples which had come from southern Sicily, recent studies have not taken the Sicilian population into account.

Nine features of cones, seeds and shoots with leaves and eight characteristic ratios were analysed using statistical methods.

Three separated groups were created from individuals in the examined populations. All samples of *J. turbinata*, including the population from Sicily, formed a single dense cluster group while individuals of *J. phoenicea* created two subgroups.

Variation coefficients in the majority of the Sicilian population's characters were showed to have the lowest values. which may indicate that this population has a rather relict character and the existing individuals today have originated from a small number of parental specimens.

These features have been observed despite the fact that the investigated population, although localized, is currently very large (over 10,000 individuals – Minissale & Sciandrello 2013. Pl. Biosyst. 147: 145-157.). It is probably that climate change in the past and human activity in recent centuries have resulted in strong contractions and rarefaction of the Sicilian population which was only able to re-expand from a few individuals in the Piano Pirrera area, as our study seems to indicate. The young geological substrates also seem to have played a role in the selection of genotypes; in fact they have been dated to the lower Pleistocene on the site investigated, and also to the Middle Pleistocene on the more coastal sites of S Sicily.

Etude de la végétation et classement des groupements végétaux au niveau du littoral Mostaganémois (ouest Algérien)

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Peu d'études quantifiant la biodiversité végétale ont été réalisées au niveau du littoral Mostaganémois (Algérie occidentale) faisant partie du secteur Oranais considéré comme un des hots spots de la méditerranée, une région traversée par deux grandes rivières la Macta et le Cheliff. La végétation est soumise à des contraintes d'origine anthropique suite aux enjeux socioéconomiques, un espace très convoité surtout une forte urbanisation et un tourisme accéléré les trois dernières décennies suite à une forte littoralisation.

Les conditions semblent réunies pour provoquer une perte des espèces végétales, allant du cordon dunaire ou la végétation est particulière et en pénétrant vers l'intérieur dans les groupements préforestiers puis forestiers. Des espèces très importantes, très nombreuses dans la région occupant des habitats différents par leurs conditions écologiques locales et faisant la particularité des écosystèmes méditerranéens. Une composition floristique très riche et un taux d'espèces endémiques élevé se trouve dans notre région d'étude qui s'intégrant dans le littoral Oranais.

Notre objectif est de contribuer à l'étude floristique et les transformations subies par les communautés végétales, répartition spatiale et temporelle des espèces végétales existantes pendant une certaine période, conservation et préservation de la biodiversité végétale s'imposent dans le cadre de la lutte contre la perte de la biodiversité ayant pour causes l'homme et les espèces envahissantes.

Pour cerner le problème un suivi sur terrain complété par une analyse et traitement des données selon une méthode d'inventaire ,de toutes les espèces ;donc il a fallut que la région géographique retenue présente une diversité phytoécologique , différents sites sont choisis ,dominés par un climat méditerranéen semi aride, sous l'influence de la mer ,par ailleurs le terrain présente des caractéristiques géologiques et édaphiques très variées (sols dunaire ,salés ,alluvionnaires ,calcaires) .qu'il s'agit du sahel ,de plaine littorale ,le long des cours d'eau ,au niveau des embouchures ou plus haut en montagne , Cette hétérogénéité se traduit au niveau de la végétation ,par l'existence de différents groupements dominés par un certain nombre d'espèces accompagnées par beaucoup d'autres .une structure adaptée.

Tracking floral nectar composition along phylogeny in *Cerinthe* (*Boraginaceae - Lithospermeae*): preliminary evidence

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The chemistry of floral nectar in angiosperms is known to be influenced by numerous constraints. Phylogenetic relationships, environmental conditions and pollinators are the major factors that affect the composition of nectar, resulting in a different degree of variability among plant groups and across different taxonomic levels.

Here we report and discuss preliminary results about the carbohydrate chemistry of the floral nectar of species and subspecies of *Cerinthe* (*Boraginaceae – Lithospermeae*). Based on a recent systematic and phylogenetic study, this genus includes two lineages: section *Cerinthe* (C1), with the group of *C. major* (three subspecies *major*, *oranensis* and *purpurascens*) and *Ceranthe* (C2), with *C. retorta, C. palaestina, C. glabra, C. tenuiflora* and the group of *C. minor* (including the three subspecies *minor*, *auricolata* and *cleiostoma*).

Analyses were performed with HPLC methods using at least five nectar samples for each species/subspecies sampled in the years 2010-2013 from plants grown in the wild or cultivated in botanical gardens.

The mean concentration of total carbohydrates in *Cerinthe* was about 405.8 µg•µl-1 (35°Brix equivalent), and ranged from 73.9 to 881.6 µg•µl-1 in *C. retorta* and *C. minor* subsp. *cleiostoma*, respectively. Average sugar concentration was higher in taxa of section C2 (349.2 vs. 438.1 µg•µl-1 in taxa of section C1) and displayed a wider range of variation. The subspecies of *C. minor* showed some of the highest concentrations (mean of the species around 600 µg•µl-1), whereas the other species of the same section (*C. tenuiflora, C. palaestina* and *C. retorta*) showed significantly lower concentrations (on average about 200 µg•µl-1).

The floral nectar of *Cerinthe* is composed mainly of sucrose, that most probably serves as an attraction for pollinators such as bees. Glucose and fructose are the dominant sugars, while polymers of the galacturonic acid, melezitose and melibiose, are minor carbohydrates, not always present. The relative percentages of major sugars range from 86% (*C. minor* subsp. *auricolata*) to 99.6% (*C. major* subsp. *purpurascens*) and a clear sucrose dominance was found in all taxa, with glucose and fructose almost equally represented. Sucrose percentage was higher in the accessions of section C2 (90.3% vs. 86.4% found in taxa of C1). A clear distinction was observed between the subspecies of *C. minor* (86.5% of sucrose) and the other species of the section, that show the highest values (on average ca. 94%).

The present results suggest that phylogenetic relationships affect carbohydrate composition of floral nectar in *Cerinthe*.

On the application of the Linnaean names *Cucubalus reflexus*, *Silene nocturna* and *S. mutabilis* (*Caryophyllaceae*)

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Recent work on the *Silene nocturna* complex in the Central Mediterranean area shows the existence of at least two species/three taxonomic units: *S. neglecta* Ten., *S. nocturna* L. subsp. *nocturna* and *S. nocturna* subsp. *capraria* (Sommier) Peruzzi & Carta. However, two other Linnaean names apart from *S. nocturna* L. (1753) (typified by Herb. Linn. No. 583.8, LINN!), are involved in this complex. *Cucubalus reflexus* L. (1753) (≡ *Silene reflexa* (L.) Ait.), typified by Herb. Linn. No. 582.22 (LINN!), has been considered a tentative synonym of *S. nocturna*. *Silene mutabilis* L. (1755) has not been formally typified (though the only original material available is Herb. Linn. No. 583.16, LINN!) and has similarly been regarded as a synonym of *S. nocturna*. Notoriously, this group of plants is not easy to observe in flower (especially in herbarium specimens) and, as many vegetative character-states partially overlap, the most reliable diagnostic characters are seed features. We have recently had the opportunity to examine the Linnaean type/original material closely, including the seeds. It is concluded that the name *S. nocturna*, which is based on cultivated material, correctly matches its current application. However, the name *S. reflexa* is applicable to a taxon with relatively long pedicels and small seeds with the cells of the dorsal part of the testa arranged in two complete rows. As a result, if recognized at species rank, *S. reflexa* is the earliest name for the taxon currently known as *S. nocturna* subsp. *capraria*. This taxon has been supposed to be a narrow endemic restricted to the island of Capraia in the Tuscan Archipelago, but it is very likely that it in fact shows a wider geographical distribution. Finally, the name *S. mutabilis*, which has relatively long pedicels and large seeds with the cells of the dorsal part of the testa polygonal in outline, refers to the taxon currently known as *S. neglecta*, and the Linnaean name is therefore the earliest name for this species.

The floristic heritage of the *Nuova Gussonea* botanic garden on Mt. Etna (Southern Italy)

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The *Nuova Gussonea* botanic garden was founded in 1979. It is located on Mt. Etna at 1700 m a.s.l., covering an area of about 10 hectares. Year after year a lot of species have been introduced in the garden and many of them have spontaneously spread.

In this work it is pointed out the floristic richness of the garden since beginning until recent time (2011). The data have been collected through field observations and examining herbarium material, annual census-papers and literature data (Poli Marchese & al. 1988. Arch. Bot. Biog. Ital. 63: 48-69; Poli Marchese & al. 2003. Bocconea 16 (2): 1149-1170; Poli Marchese & Turrisi 2007. Boll. Acc. Gioenia Sci. Nat. 40 (368): 51-91.).

The results obtained allow to highlight the diversity of the flora living in the garden in different periods; such flora is made up by native and introduced species. The native species identified are 141, 136 of which were found in a first period (Poli Marchese & al. 1988), 5 more in latest times: *Veronica verna* L. subsp. *verna*, *Monotropa hypopitys* L., *Viscum album* L. subsp. *album*, *Potentilla micrantha* Ramond, *Castanea sativa* Miller.

Every year many plants are introduced in the garden, coming from different Etnean sites, located at various altitudes and slopes. For each species many specimens are introduced. At the very beginning more than 2000 plants had been introduced to organize specific areas and to install arboreal communities (Poli Marchese 1986. Atti Conv. su: I giardini di montagna: 147-151. Torino). Then, up to 2011, nearly 3200 plants of about 700 different species and subspecies were introduced in the garden. Therefore, to sum up, all plants introduced up to 2011 are nearly 5200.

The floristic heritage of the Etnean botanic garden presents a wide diversity. It includes many significant species as: endemics (*Anthemis aetnensis* Schouw, *Scleranthus perennis* subsp. *vulcanicus* (Strobl) Bég., *Betula aetnensis* Raf., etc.), species which are largely widespread in Sicily, but very rare on Mt. Etna (*Quercus suber* L., *Pistacia lentiscus* L., etc.), species of which the Sicilian sites are only on Mt. Etna (*Asplenium septentrionale* (L.) Hoffm. subsp. *septentrionale*, *Acer platanoides* L., etc.), species which have been recently identified on the Etnean area (*Epilobium dodonaei* var. *palustre* Burn., *Ampelodesmos mauritanicus* (Poir.) T. Durand & Schinz, *Crambe hispanica* L., etc.), a new hybrid (*Saponaria sicula* Raf. x *S. officinalis* L.), and many more.

In conclusion, it can be stated that the *Nuova Gussonea* botanic garden, due to its rich and significant flora, plays a very important role for the biodiversity conservation. Not to mention the fact that the Etnean territory is located in a natural park (Mt. Etna natural park) and belongs to the UNESCO world heritage.

Moreover, it has to be underlined that this garden adheres, as well as many botanic gardens, to the strategies and actions ratified by international conventions concerning biodiversity conservation.

Genetic diversity in Sicilian populations of *Quercus ilex* (*Fagaceae*)

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Quercus ilex L. constitutes the floristic element that best summarizes the characteristics of the climate and the Mediterranean landscape. The distribution range of this oak displays bioclimatic features along with biogeographical ones, as on the one hand identifies the space pertaining to the Mediterranean evergreen forest and on the other hand it outlines quite well the Mediterranean phytogeographic region.

This species is well known for a relevant phenotypic variability, in part already treated by taxonomists at the infraspecific level. In fact, besides of the nominal subspecies and some varieties, the subsp. *ballota* (Desf.) Samp.[= *Q. rotundifolia* Lam., *Q. ilex* subsp. *rotundifolia* (Lam.) T. Morais] is widely accepted as a well distinct taxon, ranging all over the Iberian Peninsula and North-West Africa.

Recent studies on the genetic structure of the Italian populations of *Q. ilex*, demonstrated their high diversity, which turned out to be particularly accentuated in the Sicilian metapopulation (Fineschi & al. 2005. Ann. For. Sci. 62:79-84).

On the basis of the possible contacts between the populations of North Africa, in particular, with the Sicilian one, the morphological and ecological variability existing within the latter can be interpreted as the result of processes of hybridisation – probably followed by introgression processes – occurred among the populations of *Q. ilex* subsp. *ballota* and those of *Q. ilex* subsp. *ilex*. Another possible reason for such variability could be – instead of a simple contact – the past inclusion of the Sicilian Island into the distribution area of *Q. ilex* subsp. *ballota*, whose population could then be maintained on the highest part of some mountains, such as those of Madonie, where it survived up to the present day. This hypothesis would explain the rather unusual direct contact of the holm oak forests of Quacella with the beechwoods in the same area, as well as the high altitude reached (over 1750 m above sea level) by this population in the context of the distribution area of *Quercus ilex* s.l. So, the holm oak forests of Madonie heights should be regarded as a different population than *Q. ilex* subsp. *ilex*, and closer if not equal to *Q. ilex* subsp. *ballota*. Indeed, the morphological and ecological analysis conducted on the population of the Madonie mountains highlighed the divergent features from the nominal subspecies and closer characteristic to the subsp. *ballota*. Quite interestingly an ethnobiologic investigation drove to similar results, since the mountain populations of holm oak are traditionally distinct by charcoal producers as “ilici muscarinu”, juxtaposed to the normal holm-oak (simply named “ilici”) because of its harder and much durable wood.

In conclusion, this seems to be an interesting case study that induced the authors to start a biomolecular study with the purpose to better characterize the genomic features of such critical Sicilian population, in order to compare it with representative populations of the Italian Peninsula, North Africa and Spain. Preliminary results of this study already show that the individuals of the investigated mountain population share a common ancestry and, at the same time, they appear to be genetically distant from the rest of the Sicilian populations, including the ones in the rest of the Madonie area, as well as those from Pantelleria and from the island of Capri, adopted for comparison.

La suberaie de la Mâamora au Maroc en danger

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La Forêt de la Mâamora est considérée comme la plus ample subéraie d'un seul tenant du monde avec 60.000 hectares de chêne liège pur. Ce trésor écologique a perdu 1.600 hectares par an. Il n'est pas long l'époque où la Mâamora s'étendait sur pas moins de 130.000 hectares, en fait cela fait juste cinquante ans. Elle continue de produire du bois d'industrie, du liège, du bois de feu, des plantes médicinales, des champignons, etc. La subéraie de la Mâamora constitue aussi un pâturage pour 230.000 têtes d'ovins et de bovins et produit 700 tonnes de miel, 3.000 tonnes de glands doux et 85 tonnes de truffes par an. Dans la Forêt de la Mâamora il y a une riche flore vasculaire composées de plus de 400 taxons avec 18 endémiques et 64 rares e très rares (Aafi & al. 2005. Acta Bot. Malacitana 30: 127-138). Dans le même Forêt, un intérêt particulaire il jouent les petits zone humide éphémères, colonisées par des groupements végétaux de la classe *Isoëto-Nanojuncetea*, avec une particulaire présence des plantes cryptogamique: remarquable la présence d'espèces des genres *Riccia* et *Anthoceros*.

Les deux derniers siècles ont été malheureusement marqués par une rupture des relations entre l'homme et la biodiversité de la subéraie de la Mâamora. Les pressions naturelles et anthropiques croissantes entraînent un rythme d'érosion très préoccupant des ressources forestières.

Il est important de citer les principales menaces qui pèsent sur la biodiversité de patrimoine forestier à savoir :

– la perte, la fragmentation et la dégradation des habitats;
– la prolifération d'espèces exotiques envahissantes;
– la surexploitation d'espèces, ainsi que la pollution de diverses natures et les changements climatiques.

Devant cette situation alarmante, les instances nationales et internationales mènent plusieurs actions qui visent la préservation de ce patrimoine et son utilisation durable. Pour atteindre ces objectifs, *in-situ* et *ex-situ* mesures doivent être mis en œuvre.

Il y a nécessité d'intégrer les activités et des objectifs les différentes conventions sur le terrain et explorer les voies et moyens des connexions mutuelles et de renforcement. C'est ainsi que nous restons toujours convaincus que plusieurs efforts restent à déployer sur tous les fronts, sur la sensibilisation et l'éducation des populations, le développement de la recherche fondée sur une approche multidisciplinaire et multi-institutionnelle.

Des mesures d'accompagnement demeurent toutefois indispensables comme les programmes concertés de la réhabilitation des écosystèmes et de la conservation des ressources forestières par les divers moyens disponibles.

Polypodium macaronesicum reassessed

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The *Polypodium cambricum* aggregate within the Macaronesian region and the relationships of these plants to their mainland counterparts has long been controversial.

The *P. cambricum* aggregate distributed in Europe, North Africa and Western Asia, from Macaronesia in the West (archipelagos of the Azores, Madeira and the Canaries) to the Caucasus in the East, comprises taxa at three ploidy levels on the continent: the diploid *P. australe* Fée (= *P. cambricum* L.), the tetraploid *P. vulgare* L. and the hexaploid *P. interjectum* Shivas.

The *Polypodium* commonly encountered in Macaronesia is diploid. Fée (1852) suggested that this was distinct from the continental *P. australe* and formally recognised it as *P. vulgare* var. *teneriffae* Fée ex Milde (Milde, 1867); Bobrov (1964) subsequently proposed the distinction at specific level as *P. macaronesicum* A.E. Bobrov.

Nardi (1977) considered material from Macaronesia and the Mediterranean and recognised the Macaronesian taxon as a subspecies of *P. australe*. Roberts (1980) argued that there were clear, unambiguous and discontinuous characters to separate Macaronesian and continental taxa and that specific rank was most appropriate.

Within Macaronesia, the distribution maps by Bobrov (1964) suggested that the Canaries and Madeira exclusively support *P. macaronesicum* whereas in the Azores the presence of *P. australe* (= *P. cambricum*) was ambiguously indicated. Vasconcellos (1968) subsequently described *P. vulgare* subsp. *azoricum* from the Azores; Fernandes (1968) considered the Azorean taxon to be distiguishable from the Canaries and Madeira one using rhizome characters and recognised the former at specific rank as *P. azoricum* (Vasc.) R. Fernandes. However, Ward (1970) and Neuroth (1996) considered the characters used by Fernandes (1968) to be unreliable, suggesting that frond shape and degree of toothing to the rhizome scales were more useful. Nardi (1977) could identify no clear morphological distinction between *P. macaronesicum* and *P. azoricum* and considered them all to be the same taxon (*P. cambricum* subsp. *azoricum* (Vasc.) Nardi).

In view of the above sequence data from the chloroplast *trn*L-F region are used to test the delimitation of putative species in *Polypodium cambricum* aggregate. In particular we investigate the distinctiveness of the Macaronesian *Polypodium macaronesicum*, *P. azoricum* and the continental *P. cambricum*, investigate molecular diversity patterns within Macaronesia and establish the identity of putative *P. macaronesicum* material collected from an area in southern Spain.

The analysis supports the distinction of Macaronesian and continental plants with accessions from Macaronesia resolved as monophyletic. All Macaronesian haplotypes were restricted to a single archipelago and they were resolved into archipelago groupings in statistical parsimony analysis suggesting limited dispersal between archipelagos.

Material from southern Spain referred to *P. macaronesicum* is shown to exhibit the Azorean haplotype, consistent with its morphology.

High genetic diversity of some cosmopolitan mosses in the Mediterranean Sierra Nevada Mountains

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Elevational gradients in genetic diversity within species are nearly as ubiquitous as latitudinal gradients, and they offer many characteristics that make them perhaps more suitable for uncovering the underlying cause(s) of spatial variation in diversity. The adaption process forms part of the evolution of a species, which is the ability of a population of organisms to not merely generate genetic diversity, but to generate adaptive genetic diversity, and thereby evolve through natural selection (Colegrave & Collins 2008. Heredity 100: 464-470).

The genetic diversity of three cosmopolitan moss species has been studied along an altitudinal gradient in Sierra Nevada Mountains (South Spain): *Bryum argenteum* Hedw., *Ceratodon purpureus* (Hedw.) Brid, and *Funaria hygrometrica* Hedw. Also some other specimens from the Mediterranean and other parts of the world have been studied.

Different molecular markers have been used in each species: ITS nrDNA and *rps*4 *cp*DNA sequences for Bryum argenteum; ITS2 and *atp*B-*rbc*L *cp*DNA sequences for Ceratodon purpureus; ITS1, ITS2, *rps*3-*rp*l16 *cp*DNA, and *rp*l5-*rp*l16 *mt*DNA, as well as microsatellites and AFLP for *Funaria hygrometrica*.

In the tree cases a surprising high genetic variability was observed. In *Bryum argenteum* the diversity is clearly structured according to altitude, and two genotypes are clearly distinguished, one of them is restricted to samples found in Sierra Nevada only above 2000 m a.s.l. and it was known before only from the Antarctic region and might be restricted to cold environments. In *Ceratodon purpureus* two distantly related genotype groups were found. Until now one of them is only known from Sierra Nevada. The clear genetic distance between the two groups from Sierra Nevada exceeds the reported genetic distance between more geographically distant regions described before. Evidence for a possible natural hybridization between the different lineages of *C. purpureus* present in Sierra Nevada was found. This is in contrast with earlier reports that show that artificially produced hybrids between distant lineages within *C. purpureus* show a reduced viability (McDaniel & al. 2007. Genetics 176: 2489-2500). In *Funaria hygrometrica* the results obtained revealed also the existence of two genetically divergent lineages. One might be adapted especially to dry Mediterranean habitats. At higher altitudes the two lineages grow together and cross, while at lower altitudes the supposed Mediterranean type is much more frequent.

Together these examples show the importance of Mediterranean mountain systems with their highly variable environmental conditions and the presence of genetically diverse lineages of bryophytes as a possible source for future adaptive responses to selective pressures related with climate change.

Karyological studies on some endemic and rare species of Kefalonia

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Karyological investigations contribute significantly to biosystematic studies and play a significant role in the distinction of some morphologically indistinguishable taxa.

Kefalonia is the largest island of the Ionian Sea (West Greece) and has a very rich flora. Although only a few, i.e. 5 taxa have been found to be stenoendemic of the island, a lot of Greek endemic species are also distributed there. Among other things, this implies that Kefalonia is an island, derived from the mainland, rather than from the sea. For instance, it is the only island of Greece characterized by an *Abies cephalonica* fir forest, with Mt. Ainos being its "*locus classicus*". Based on its floristic elements and their distribution, Kefalonia belongs to the Adriatic-Ionian phytogeographical region.

During this study, endemic and rare species of Kefalonia were karyologically examined, following their cultivation in the Experimental Botanic Garden of the University of Patras. Apart from their chromosome numbers and comments on the karyotype morphology, data are also given about their habitat, and on potential threats.

Finally, an attempt is being made to assess the conservation status of their populations and suggest measures for their protection and sustainable management.

Effect of tree architecture on pollen dispersal and mating patterns in a low density population of *Abies pinsapo* (*Pinaceae*)

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Plant architecture is crucial to pollination and mating in wind pollinated species; however, it has rarely been studied in conifers. Here, we investigated the effect of crown architecture on pollen dispersal and mating system of the monoecious *Abies pinsapo* by genotyping 598 embryos from three height levels in five mother plants with eleven nuclear microsatellite markers (nSSRs) in a low-density population. Paternity analysis and mating system models were used to infer mating and pollen dispersal parameters. In addition, seeds were weighed (N = 16,110), germinated (N = 736), and seedling vigour was measured to investigate inbreeding depression. Overall, *A. pinsapo* showed a fat-tailed dispersal kernel but a short average pollination distance (113 m direct estimate, 227 m indirect estimate), a low migration rate among populations (0.84–26.92% direct estimates, 15% indirect estimate) and a very low number of effective pollen donors (Nep = 3.5–11.9). A strong effect of tree height and height level on mating parameters was found. Higher rates of seeds with embryo (about 50 %) and self-fertilization (about 60%) were found at the bottom level of cone distribution than at the top level. Seed weight and seedling vigour were positively related. Nevertheless, no differences were found either in seed weight or in seedling-related variables for the different height levels in the tree (which differed in selfing rate) suggesting absence of inbreeding depression. The evolution of a mixed mating system in *A. pinsapo* is discussed in terms of reproductive assurance, pollen limitation and gender architectural effects.

Results of efforts made for *in situ* and *ex situ* conservation of *Abies nebrodensis* (*Pinaceae*) in Sicily

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Abies nebrodensis (Lojac.) Mattei is a heavily threatened relict endemic species, consisting of a wild population formed by a whole of 30 individuals confined in a small area in the Polizzi Generosa district, within the Madonie Natural Park, north Sicily.

The threaten of extinction is mainly due to the slightness of the population only part of which is made of fertile specimens, and besides to the risk of genetic pollution caused by the occurrence of *Abies alba* Mill., *A. cephalonica* Loudon and *A. nordmanniana* (Stefen) Spach rather recently introduced all around the distribution area.

Since 2002, the Park of Madonie Office, backed by both the Palermo University botanists and the Azienda Regionale Foreste Demaniali staff, has set up a both technical and scientific programme for *in situ* and *ex situ* conservation of *A. nebrodensis*.

In particular, between 2002 and 2005 a Life Natura programme has been fulfilled aimed at to protect and genetically characterize of the wild *A. nebrodensis* population and its progeny in its range, by surveying of the wild renewal and the occurrence of exotic firs, the setting up a seedling nursery and the plantation of several experimental parcels. Since 2010 this programme is carried on by means a plan granted by CIPE in which also the restoration of small *Sphagnum* bogs scattered around the range of *A. nebrodensis* in the district of di Geraci Siculo is included.

In the last 10 years these activities have given the following results:

- Controlled pollination inside the *A. nebrodensis* wild population has been carried out in order to increase its genetic variability and to produce a genetically pure seed stock. More than 95% strobiles produced fertile seeds from which 5.000 partly mycorrhized seedlings were obtained.
- The experimental parcels have shown that the best plantations are located on quartzarenite ground, in north-facing places between 1000 and 1500 m elevation.
- Genetic analysis has pointed out a considerable individual diversity in the wild population; besides a close correlation among mature wild individuals and their seedlings, both wild as cultivated in the nursery, has been observed.
- About 5.000 mostly mature exotic fir specimens have di been localized, more than 1000 of which have been graft by shoots of *A. nebrodensis*. This, in order to increase its population and to exploit as rootstock other firs to be cut down to avoid a serious conservational danger.
- The rescue of the marshy body of the "Urgo di Pietra Giordano" has been carried outby removing , through naturalistic engineering technique, damages provoked in the past and restoring the water supply essential to re-establish the previous peat bog plant community.
- In the wild population active renewal process has been observed around 8 of the 24 specimens producing fertile strobiles. Indeed, with respect to the 45 ones first recorded, the wild individuals (including seedlings) now observed throughout the range *A. nebrodensis* are 151. These are 1-30 years old and up to 42 cm high. The increased number of seed born individuals on account of the above outlined actions for the in situ conservation shows a remarkable reversal of trend in the *A. nebrodensis* population dynamic.

Morphological diversity of *Cupressus sempervirens* and *C. atlantica* from the Mediterranean region

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The Mediterranean region is recognised as one of the major world's biodiversity hotspots. The diverse topographic, climatic conditions and the wide spectrum of the habitats being the legacy of the complex geological history have made this region a centre of an active speciation. The Mediterranean region is characterised by great biological diversity and profound endemism that provide an opportunity for direct investigations of on-going evolutionary processes.

The genus *Cupressus* L. is represented in the Mediterranean Basin by three taxa forming a circum-Mediterranean group: *Cupressus sempervirens* L., *C. atlantica* Gaussen and *C. dupreziana* Camus. These taxa occur in the areas of the Pleistocene refugia of Tertiary floras. The natural range of *C. sempervirens* is formed by disjunctive, often relict populations in western part of this region. The other taxa are endemic and limited to very small populations in the eastern part of the this region.

The aim of the project was to investigated the morphological relationship between natural populations of *C. sempervirens* and *C. atlantica* in geographic context. Four populations of *C. atlantica* from Morocco and 5 populations of *C. sempervirens* from Greece and Turkey were sampled. The morphological variation of cone, seed and shoot traits were studied using biometrical methods.

In general, the results of the studies revealed the geographic trends of morphological differentiation patterns at the inter-population level. The western-Mediterranean populations were distinct from the Eastern-Mediterranean ones. According to the cluster and discrimination analysis the two different taxonomic groups were defined. Greek and Turkish populations formed one cluster while all remaining populations were formed the second group. In previous examinations, similar trend was also indicated in the other conifers from Mediterranean Region, e.g. *Cedrus* and *Juniperus* species, which is probably the result of long spatial isolation during the Pleistocene. The systematic position of the Mediterranean cypresses taxa is not clear and our investigation attempted to provide additional information of inter-specific relationships among them, that may have taxonomical implications.

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Espèces endémiques et rares des monts des Traras (Tlemcen, Algérie)

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Le massif des Traras en bordure de la méditerranée culminant à 1100 m, présente une diversité écologique variable entre microclimat humide sur versant nord à microclimat aride sur versant sud. Différents substrats y'affleurent, tels les grés, les schistes, les calcaires, les marnes, les sables et les dépressions salées qui hébergent des formations herbacées très diversifiées. A partir de 100 relevés réalisés entre 2008 et 2012, l'analyse des groupements herbacés des Traras nous a amené à recenser 360 espèces environ relevant de 50 familles avec un endémisme notable. Sur l'ensemble des taxons, il existe plus d'une dizaine d'espèces endémiques du nord-ouest algérien et du Maroc nord-oriental. L'espèce endémique la plus rare des Traras est *Astragalus faurei* de Maire. Une légumineuse annuelle rampante, très liée au substrat gréseux. Fleuri en avril et fructifie à partir de mi mai en formant des petites gousses grisâtre très hispide. Ce taxon fait partie d'un groupement à *Plantago lagopus* et *Scorpiurus muricatus* formant des pelouses théro-xérophytique, lié à aux *Tuberarietea guttatae*. Une seconde espèce appartenant aux brassicaceae, *Cordylocarpus muricatus* Desf., éphémère endémique algéro-marocaine qui apparait dans les champs abandonnés, friches et jachères, tolère bien les chaleurs estivales prolongées. De même, cette xérophyte calcifuge ne supporte pas les altitudes au-delà de 700 m et abonde sur substrat caillouteux incliné. Elle ressort chaque fois dans les relevés où est indiquée une action de pâturage. Enfin, *Centaurea involucrata* Desf. est une endémique algéro-marocaine qui s'observe essentiellement dans les pâturages arides. Cette asteracea qui dans ces monts se fait de plus en plus rare, semble être liée aux *Tuberarietea guttatae* (Br-BL 1940; Rivas Goday 1957).

Diversity of Flora of the Pshavi, Tusheti and Khevsureti (SE and NE part of the Greater Caucasus)

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This abstract presents the results of systematic, chorological and ecopathological studies of the diversity of the Flora of Pshavi, Tusheti and Khevsureti (SE and NE Part of Greater Caucasus). It is based on field investigation and on literature research. The following vegetation belts are distinguished there: mountain-1000 (1200)- 1700 (1800) m, subalpine – 1800 (1900)-2400 (2500) m, alpine – 2500 (2600)-2800 (2900) m, subnival – 2900 (3000)-3800 (4000) m, nival – above 3800 (4000) m. On the north-facing slopes (Pirikiti Khevsureti and Tusheti) pine and birch forests (*Pinus sosnowskyi*, *Betula raddeana, B. litwinowii*) are particularly important and south-facing slopes (Piraketi Khevsureti and Pshavi)- oack, hornbeam and beech forests (*Quercus iberica, Carpinus betulus, Fagus orientalis*).

1203 Vascular Plants species, 434 genera and 103 families were recorded in the montane, subalpine, alpine and subnival belt of the Tush-Pshav Khevsureti within a range of 1000(1200)-3500(4000) m a.s.l. Among these 236 species or 19,6% are common endemics of the Greater Caucasus and Caucasus. An interesting regularity is observed concerning lithophilous flora occurring at different elevations. Particularly, the percentage of the endemic species increases with increasing elevation. In the region the floristically most interesting part are the Tusheti and N Khevsureti (north part of the east Caucasus).

The leading families are *Asteraceae* (170 species), *Poaceae* (79 species), *Scrophulariaceae* (65 species) *Caryophyllaceae*, *Fabaceae* (each 63 species), *Brassicaceae* (62 species), *Rosaceae* (61 species), *Apiaceae*, *Cyperaceae* (each 52 species), *Lamiaceae* (50), *Boraginaceae* (34), *Polygonaceae* (22 species), *Geraniaceae*, *Primulaceae* (each 17 species). The leading genera are *Carex* (39 species), *Veronica* (18 species), *Campanula* (15 species), *Rosa* (14 species), *Cerastium*, *Scrophularia* (each 12 species), *Primula*, *Saxifraga*, (each 11 species), *Verbascum* (10 species), *Pedicularis*, *Potentilla*, *Minuartia* (each 9 species).

The flora is into 9 chorological types (PALEARKT., OLARKT, CAUC- AS. MIN, CAUC- AS. ANTER, CAUC, EUCAUC, EUROP, MEDIT, PANCONT.) and more 33 subtypes. The chorological spectrum shows the dominance of Caucasus-Minor Asian, Palearctic, Caucasus-Anterior Asian, Holarctic, Caucasian and Eucaucasian elements.

Species composition and coenotic role are different in various parts of SE and NE of the Greater Caucasus and within each part. This is conditioned by the different hypsometry of various parts of the study area, the character of glaciations, edaphic and climatic conditions, lithological diversity.

Pollen quantitative parameters of *Ramonda nathaliae* and *Haberlea rhodopensis* (*Gesneriaceae*)

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In this study, pollen quantitative variables of *Haberlea rhodopensis* and *Ramonda nathaliae* were measured and statistically analysed. The following seven populations from northern Greece were sampled for their pollen grains: 2 populations of *Haberlea rhodopensis* from the valley of Nestos river (HabNes1, HabNes2), two populations of *Haberlea rhodopensis* from Rhodopi Mountains (HAbRh1, HAbRh2), two populations of *Ramonda nathaliae* from Tzena mountain (RamTz1, RamTz2) and one population of the latter species, from Paiko mount. The pollen grains were studied with the Light Microscope (LM) after they have been acetolysed first. The variables that have been subjected to One –Way Analysis of Variance (ANOVA), using SPSS 20, were: Polar Axis (P), Equatorial Axis (E), distance between two colpi at the equatorial area (ColEDis), distance between two colpi at the polar area (ColPDis), shape (P/E), apocolpium index. The results have shown that the two populations of *Haberlea rhodopensis* from Rhodopi mountain were the most differentiated among themselves and the rest of the populations. Generally, the species *Ramonda nathaliae* was more cohesive than the one of *Haberlea rhodopensis* with regard to the pollen variables that were analysed here. As far as the shape is concerned, the pollen grains were in general spherical- spheroid (Shape (P/E)≈ 1), except for HabRh2 which had mostly sub-ovoid pollen grains (Shape≈ 1,2). Furthermore, the two species, which belong to the subfamily of *Cyrtandroidae*, have pollen sizes (size = Polar axis length < 25μm) which are in agreement with previously published data for this subfamily.

The polyploid *Alyssum montanum-A. repens* complex in the Western Mediterranean: a hotspot of species and genetic diversity

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The *Alyssum montanum-A. repens* complex (*Brassicaceae*) is a group of perennial herbs growing on calcareous or serpentine rocks, sands and in dry grasslands. They occur in most of Europe and adjacent areas with the highest diversity in the south. Several species and numerous infraspecific taxa were traditionally recognized within this group. The primary focus of our studies was to unravel evolutionary history of this complex and to propose sound taxonomic concepts.

Recently, we reassessed the infraspecific classification of *A. montanum* in C Europe and *A. diffusum* in the Apennine Peninsula and we brought first insights into the evolutionary history of this complex. In ongoing studies we focus on populations from W Europe, including Iberian Peninsula and from Morocco, employing flow cytometry, multivariate morphometry, AFLP analyses, and cpDNA sequences.

Our results indicate that populations from W, SW Europe and Morocco form a natural group of closely related species, genetically distinct from Central European, Balkan and Apennine populations. Only the polyploids *A. orophilum* and *A. cuneifolium* s.l. from Mt. Ventoux stand inbetween what might indicate their allopolyploid origin. Populations attributed to the alpine *A. cuneifolium* s.l. from the Apennines, Pirin Mts (*A. cuneifolium* subsp. *pirinicum*), Olympos Mts (*A. handelii*), Mt. Ventoux and the Pyrenees are clearly polyphyletic and mostly genetically close to geographically adjacent populations, indicating independent, parallel adaptations to high alpine habitats with convergent morphology. *A. montanum* subsp. *montanum* (France, Germany, Switzerland) appears rather genetically heterogeneous and this variation is correlated with ploidy levels and geography. Its conspecific classification with genetically distinct C European A. montanum subsp. gmelinii is challenged. Our results suggest that French stenoendemic *A. rhodanense* is allohexaploid, morphologically and genetically well supported species. *A. montanum* s.l. from Spain should represent a separate taxon which is genetically divided into two or three as yet morphologically undistinguishable subgroups. Traditionally recognised *A. gadorense* and *A. nevadense* are not supported. Populations of *A. montanum* s.l./*A. atlanticum* from Morocco are genetically distinct from Spanish ones and should be recognized as a separate taxon. Eastern populations of *A. loiseleurii* from Aquitane and Euskadi (subsp. *loiseleurii*) are clearly genetically, although not so much morphologically, different from western populations from Galicia (subsp. *gallaecicum*) and should be recognized as two separate species. Eastern populations are genetically unique, western ones are very close to adjacent Spanish populations of *A. montanum* s.l. Their similar morphology could be a consequence of convergent adaptation to coastal sandy dunes.

The effect of microclimate on lichens in the Negev Desert, Israel

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Lichens play a pivotal role in the terrestrial food chain, and as providers of nutrients and organic matter to the ecosystem. They also play an important role in rock weathering and soil formation. Therefore, any information about lichens in different environments is very important for understanding the processes occurring in the ecosystems. This is especially important for desert ecosystems where scarcity of rain may severely limit the ecosystem production. However, the role of many microclimatic factors in the development of lichen biota in desert areas remains poorly investigated.

The Negev Desert occupies about 60% of the southern part of Israel. The climate of the Negev is arid with annual rainfall ranging from more than 300 mm in the northwest to about 25 mm in the south. Most of the Negev area consists of marine rocks, mainly limestones and chalks. Rocks, stones, and soil of the area are densely covered by microorganisms, including lichens.

To elucidate the role of the desert microclimate in the development and distribution of lichen biota, lichen communities in different habitats in the Negev desert were analyzed. At each habitat, the rain, radiation, dewfall, substrate temperatures, and wetness duration were monitored. Special focus was on studying the influence of the dew moisture regime and substrate temperatures on rates of lichen colonization of exposed substrates, distribution of lichen growth forms, and on lichen diversity patterns. The following characteristics of lichen communities were studied: species richness, systematic diversity, biogeographical elements, frequencies and distribution of species, their morphological and anatomical characteristics, reproductive strategy, and ecological peculiarities.

Studies showed that the main factor controlling the development of lichen biota in the Negev desert was dew availability. Dew was responsible for the morphological and anatomical changes in different lichen species, the fast rate of lichen colonization of exposed substrates, and the structure and distribution of lichen communities. The comparison of lichen community structures on cobbles in the central Negev with dew moisture regimes that characterize these habitats indicated species that can be used as indicators for dew amount and especially for dew duration. The findings may assist us in identifying lichens that may serve as biomarkers for dew availability and in anticipating changes in lichen communities following global warming. By serving as biomarkers, lichens may provide important information on dew regimes in complex terrains where microclimatological data are usually scarce.

Towards a Critical Flora of Italy: Assessing the *Lycopodiophyta*

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In the framework of the project for a new Critical Flora of Italy, promoted by the Società Botanica Italiana and supported by the Fondazione per la Flora Italiana together with the International Foundation *pro Herbario Mediterraneo*, preliminary results relating to the lycophytes (*Lycopodiophyta*), the most primitive extant group of vascular plants, are presented.

It is now generally agreed that an early phylogenetic dichotomy occurred in the early-mid Devonian (ca. 400 million years ago), separating a clade that includes the modern lycophytes (less than 1% of extant vascular plants) from a clade that contains all other living vascular plant lineages, the so called "euphyllophytes" (Pryer & al., Amer. J. Bot. 91: 1582–1598. 2004). The extant lycophytes all possess "microphylls" and comprise three main lineages: homosporous *Lycopodiaceae* (clubmosses), and heterosporous *Isoetaceae* (quillworts) and *Selaginellaceae* (spikemosses).

Ferns and lycophytes, spore-bearing and lacking seeds, are traditionally known as pteridophytes or "ferns and fern allies". This is a paraphyletic assemblage that for the purpose of a natural classification is better abandoned. It is preferable, in a taxonomic context, to use the name *Pteridophyta* for the ferns alone and refer to the basal clade as *Lycopodiophyta*.

After a critical re-examination of previous literature and concomitant herbarium studies, we present the following inventory of the Italian representatives of the three *Lycopodiophyta* families:

Lycopodiaceae. – Three genera with 8 species: *Huperzia* Bernh. (1 species), *Lycopodiella* Holub (1 species), and *Lycopodium* L. (6 species). According to recent molecular studies (e.g. Wikström & Kenrick, Molec. Phylogenet. Evol. 19: 177-186. 2001), the genus *Diphasiastrum* Holub (= *Diphasium* C. Presl ex Rothm. p.p.), accepted in several recent works, is better treated at sectional level, as *Lycopodium* sect. *Complanata* Victorin (3 species and their 3 hybrids). We accept as a member of the Italian flora *L. lagopus* (Laest. ex Hartm.) Zinserl. ex Kusen. (= *L. clavatum* subsp. monostachyon (Desv.) Selander), a controversial taxon re-evaluated and reported for Italy by Tribsch & Schönswetter (Verh. Zool.-Bot. Ges. Österreich 136: 235-248. 1999).

Isoetaceae. – One genus with 10 taxa: *Isoetes* L. The circumscription, and identification of *Isoetes* species remain difficult because, due to the extreme morphological simplicity of the plants combined with phenotypic plasticity, the number of stable and useful diagnostic characters is very limited. Our work (in press) included new type designations and some nomenclatural novelties.

Selaginellaceae. – One genus with 3 species: *Selaginella* P. Beauv., with the arctic-alpine *S. selaginoides* (L.) P. Beauv., *S. helvetica* (L.) Spring and *S. denticulata* (L.) Spring. The genus should probably be split into subgenera and/or sections, but this is not appropriate without a previous critical assessment on a world scale of its ca. 750 species.

Seed morphology and its taxonomic implications in *Pyrus* (*Rosaceae*) Taxa in Turkey

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The species of *Pyrus* L. (*Rosaceae*) in Turkey have many local variants and it is difficult to distinguish them from each other easily. Seven *Pyrus* species, including two endemic taxa, have been examined by stereo microscope and SEM to determine their seeds characters which would be useful in their taxonomy. Macro- and micromorphological characters including shape, colour and surface sculpturing have been determined and their size has been also calculated. Length of the examined seeds ranges from 4.5 to 8 mm and their widths is 3.5 to 5 mm. Seed colour is brownish to dark brown and shape is narrowly ovate with acute apex. The surface of the seeds has mainly various types of reticulate or striate ornamentation. The seed surface is covered with various types of cells including papillate, ocellate and other types of the cells. According to our preliminary results, the species of the genus *Pyrus* would be distinguished from each other, at least in basic groups. In this study, all of these results have been evaluated from taxonomical point of view.

Mountain flora of Sila (S Italy) - ecological characteristics and phytogeography

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The Sila Massif (South Italy), because of its geographical position (in the centre of the Mediterranean region), geology (a granitic "island") and peculiar bioclimatic characteristics is a territory of remarkable phytogeographic interest. Floristic data (about 15000 records) from literature, herbarium and field studies 1998-2013 have been used in order to produce an updated check-list of the Sila Mountain flora. Floristic analysis considered species occurring from mesophilous oak woods (about 700 m), beech and Calabrian pine (*Pinus nigra* subsp. *calabrica*) vegetation up to 2000 (1927) m a.s.l. For every species ecological parameters are identified such as attitude to basic rock, attitude to water regime, life form (after Raunkiaer), vertical distribution (valuated using altitudinal steps of 500 m) and horizontal distribution (geoelement). For the analysis the concept of "concrete" flora is applied and some hypothesis for flora relations and consolidation are evaluated.

The flora of Sila consists of about 1000 species; more than 400 genera and around 100 families, with some interesting endemisms exclusive of its territory such as *Adenocarpus tenoreanus* Brullo, Gangale & Uzunov, *Astragalus calabricus* Fiori, *Armeria brutia* Brullo, Gangale & Uzunov, A*nthemis hydruntina* subsp. *silensis* (Fiori) Brullo, Gangale & Uzunov, *Centaurea sarfattiana* Brullo, Gangale & Uzunov, *Genista silana* Brullo, Gangale & Spampinato, *Koeleria splendens* subsp. *brutia* Brullo, Gangale & Uzunov, *Luzula calabra* Ten., *Cardamine silana* Marhold & Perny, ecc. Because of its geological and climatic characteristics, particularly significant is the group of boreal species, glacial relicts often with very isolated populations and at southernmost limit of their distribution area. The group of species with "Northern" distribution is about 10%, between them *Viola palustris* L., *Schoenoplectus supinus* Palla, *Limosella aquatica* L., etc. with disjuncted area of distribution and *Bistorta officinalis* Delarbre, *Leontodon saxatilis* Lam., *Carex echinata* Murray, *Eleocharis acicularis* (L.) Roem. & Schult., *Epilobium palustre* L., *Pyrola minor* L., *Pyrola chlorantha* Swartz in the southernmost limits of their areal. An analysis of mountainous plant communities has been carried out in order to investigate paleogeographic, ecological and anthropic factors that influence flora and vegetation diversity. On the basis of ecological and phytogeographical analysis (with special attention to the endemic species) some paleogeographic correlations between Calabrian flora and neighbouring territories are emphasized.

Ex situ conservation of Mediterranean Bryophytes

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Experiments have been carried out to establish the protocols for the *ex situ* conservation of four threatened or rare Mediterranean moss species. They are: the endemic Canarian *Orthotrichum handiense* F. Lara, Garilleti & Mazimpaka, listed as Endangered in the Atlas and Red Book of the Threatened Spanish Bryophytes (Garilleti & Albertos 2012. Atlas y Libro Rojo de los Briófitos Amenazados de España, Madrid); the central European, western Asian and Mediterranean *Entosthodon hungaricus* (Boros) Loeske (= *E. longicollis* (Trab.) Ros & M.J. Cano nom. illeg.), considered as Near Threatened in the Spanish Bryophyte Red List (Brugués & González-Mancebo 2012. In: Garilleti & Albertos, Atlas y Libro Rojo de los Briófitos Amenazados de España, Madrid, pp. 25-42); the strictly Mediterranean *Entosthodon commutatus* Durieu & Mont., reported mainly from isolated localities in its distribution area, considered as Data Defficient in the Spanish Bryophyte Red List; *Funariella curviseta* (Schwägr.) Sérgio, a more frequent Mediterranean species, considered as Endangered in the Italian Bryophyte Red List (Cortini Pedrotti & Aleffi 1992. In: Conti & al., Libro rosso delle piante d'Italia, Roma, pp. 559-637).

After in vitro culture of the four species cryopreservation tests were undertaken. The need for *ex situ* conservation projects of bryophytes in the Mediterranean area is emphasized. The complementation of the New Red Data Book of European Bryophytes that is in preparation by the ECCB taking in consideration all the Mediterranean species is desirable in order to establish conservation priorities.

Morphometric and reproductive variation in the strict endemic *Helichrysum melitense* (*Asteraceae*) in Gozo, Malta

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The aim of this study was to characterise the distribution, leaf-morphological amplitude and reproductive effort of the strict island endemic *Helichrysum melitense* (Pignatti) Brullo, Lanfranco, Pavone & Ronsisvalle (*Asteraceae*) in Gozo, Malta.

This species is restricted to the coastal fringe of Western Gozo and was rarely observed further inland. Five main sub-populations, those at Ponta tal-Wardija, Tal-Port, Fuq il-Qawra, Ta' Slima and at Il-Ponta ta' Hekka, were recorded and surveyed. A total of 983 plants were investigated. The largest sub-population was that at Tal-Port (364 individuals) whilst the smallest was the one at Il-Ponta ta' Hekka (30 individuals).

The plant has very low fertility. Out of 4877 flowers that were dissected, 2836 had not set seed, and only a small proportion (7.23%) of the seeds that formed were found to be potentially viable. Despite the low seed production, the overall population size has not been observed to diminish over the past thirty years, suggesting that this low reproductive rate may nonetheless represent replacement level for the species.

Variation in leaf morphometry (leaf length, leaf width and leaf area) was investigated across the five main sub-populations. The sub-population at Il-Ponta tal-Wardija and Ta' Slima had long and narrow leaves, those at Fuq il-Qawra and Tal-Port had short and narrow leaves while the smallest sub-population at Il-Ponta ta' Hekka had very long and broad leaves. Variations in leaf morphometry within and across sub-populations showed low, non-significant correlation with environmental factors and thus were attributed to intrapopulation variation.

Comparison of leaf morphometry between *H. melitense* and *Helichrysum rupestre*, (within which the Gozo populations were originally placed by Pignatti) showed a statistically-significant difference on the basis of leaf width. This does not confirm whether *H. melitense* is a distinct species or not, as leaf morphometry is highly variable across the genus *Helichrysum*.

Seed morphology of *Orobanchaceae* genera from Turkey, and their systematic significance

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The family *Orobanchaceae* Vent. comprising a morphologically diverse hemiparasitic and holoparasitic genera represented with 16 genera in Turkey. These genera are mainly distributed throughout the subtropical and temperate regions of the northern hemisphere and the Mediterranean region is one of the diversity centers of the family. A comprehensive morphological study was carried out on the seeds of some (12) genera from *Orobanchaceae*. Our results indicated that the use of seed morphology characters have a great importance, particularly in *Orobanchaceae*, which possesses a much reduced vegetative growth and consequently provides few vegetative characters for taxonomic purposes.

According to our results, the most useful seed features in identification of taxa were the shape, size and seed-coat ornamentation of the seeds. The morphology of the seed coat provides a set of useful characters, and the tribe *Orobancheae* with polygonal cell is clearly separated from the tribe *Rhinantheae*. Features of the tangential wall in the epidermal cells of the seeds of the tribe *Orobancheae* genera allow us to establish different groups in generic level. In the tribe *Rhinantheae* based on presence of wings, and other characters of the epidermal seed coat cells 3 groups recognised. *Rhinanthus* with winged seed, *Melampyrum* with smooth seed surface, *Bartsia*, *Bornmuellerantha*, *Parentucellia*, *Odontites*, *Pedicularis* and *Lathrea* with reticulate pattern constitute 3 different groups. The majority of the examined genera have light or very small seeds but some of them produce larger seeds. The systematic utility of characteristics of these plant structures is discussed in order to determine relationships among the different genera included in this family. A dichotomous identification key was presented along with seed descriptions, measurements and morphological details, LM photos and SEM micrographs.

Index of authors

Contents

Last-minute additions

All that glitters is not gold: Assessing intercontinental disjunctions in genus *Orthotrichum*

Garilleti R.[1], Mazimpaka V.[2], Lara F.[2]

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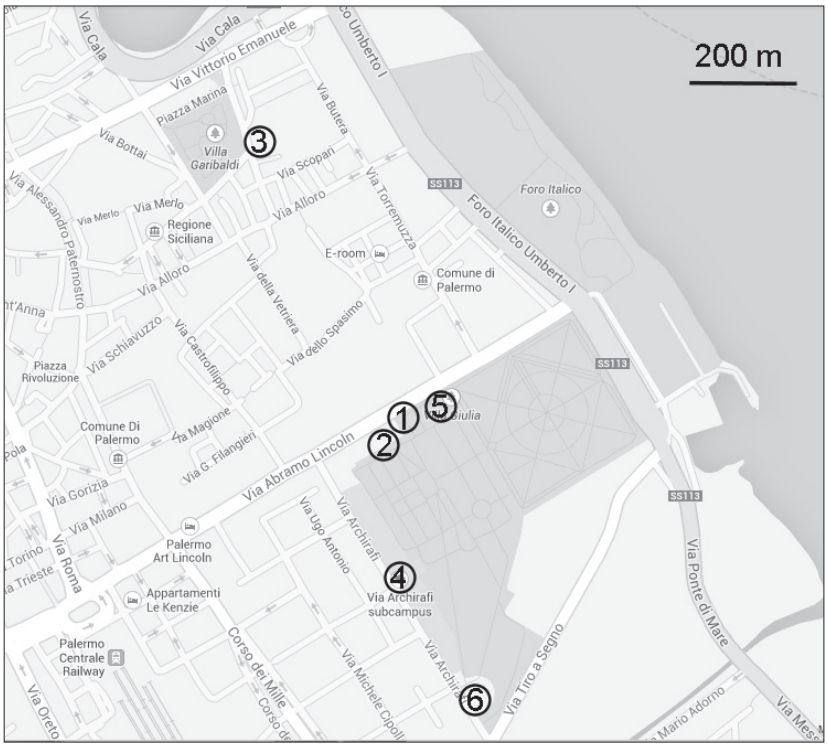
Bryophytes tend to show wider distribution ranges than flowering plants and disjunctions –highly discontinuous distribution ranges, often involving more than one continent– are remarkably frequent. Two models are commonly used to explain the origin of disjunctions: 1) they are the result of fragmentation of continuous ancient areas; and 2) the small spores and/or propagules of bryophytes allow a long-distance dispersal. A number of cases show that both processes coexist.

The explanation based on relict areas is supported by the general concordance of the distribution ranges showed by bryophytes and vascular plants. In any case, if an isolation originated this way is old enough, different populations will follow some genetic divergence, sometimes morphologically difficult or almost impossible to notice (cryptospecies). In case of the long-distance dispersal, it seems reasonable that the processes which create the range of a taxon continues working nowadays and genetic coherence between populations may be expected, but this is an a priori assumption to be studied, as unique or very rare events can be the origin of present ranges.

Several bryophyte groups show a reduced number of differential traits (they can be defined as morphologically austere), which often are also subtle, resulting in morphological similarities that have frequently led to taxonomic confusion and to a wrong interpretation of the present areas and the evolutionary history of some taxa.

Genus *Orthotrichum* has revealed itself as a useful laboratory for studies on integrative taxonomy (a noteworthy number of relevant characters useful for fine distinction between taxa and a notable phylogenetic complexity) and biogeography. Understanding the actual distribution patterns within an important group of bryophytes will give us new insights on the biological history of them, as well as of the evolutionary processes involved in it.

It seems logic to think that within a genus most or all types of distributions or disjunctions known are equally true and respond to the same origin, but this not accurate. We are gathering in genus *Orthotrichum* extensive evidence indicating that casuistry is highly varied and carefully study of each and every one of the species considered a disjunct distribution is needed. In the lecture, we will expound about some representative cases concerning the disjunction Western North America/Europe, which illustrate different phylogenetic and biogeographic histories.



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1. Orto Botanico, via Lincoln 2;
2. Herbarium Mediterraneum, Orto Botanico, via Lincoln 2;
3. Palazzo Steri, Piazza Marina 61;
4. Lecture halls, via Archirafi 32;
5. Aula Lanza, Orto Botanico, via Lincoln 2;
6. Dipartimento STEBICEF / Sez. Botanica, via Archirafi 38.

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Lichen studies in the Mediterranean area

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The study of the lichens growing in the Mediterranean area was purposed by the first OPTIMA Lichen Commission, following Joseph Poelt's ideas and helped by the results of the UNESCO Rio Conference (1992). Twenty years latter the UNESCO still considers that the world biodiversity is crucial for promoting sustainable development and reduce people poverty pointing out the economic value of biodiversity and ecosystems.

Several advances have been done in the knowledge of the diversity of Mediterranean lichens, although a checklist is not finished yet. Pier Lugi Nimis (1996) in Bocconea 6, pointed out the main problems founded, basically the concept of Mediterranean lichens.

The contributions included in this Symposium show the different lines which are developing lichenologists working with lichens growing in south Europe. All of the contributions are leading to a better understanding of the lichen Mediterranean biota.

The updating of lichen diversity of the Balkan Peninsula is presented by Helmut Mayrhofer and coworkers from, a traditional forgotten area for many reasons.

Myself will submit a second contribution pointing out the knowledge value of a lichen group to develop new studies in lichen taxonomy showing the case of the genus *Cladonia*.

Two of the contributions presented by the Ana Crespo team are related with the use of molecular tools to resolve some taxonomic problems of *Bryoria* sect. *Implexae* and questions related with cryptic speciation where is stated that some of the most familiar "species" in the *Parmeliaceae* are not single species.

Finally, Olga Nadyeina and Cristoph Scheidegger will explain the difficulties and obstacles found making Lichen Red Lists.

Cistanche armena (K. Koch) M. V. Agab. (*Orobanchaceae*): an undeservedly forgotten species

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Cistanche, a member of the *Orobanchaceae* family, is less diverse than *Orobanche* but of similar complexity. Its species are found throughout Eurasia but are narrowly specialised ecologically, growing on sandy saline soils with high water deficit in desert, semi-desert and steppe vegetation. The parasitic habit of these plant enhances their specialisation on specific host plants living under the same conditions. According to the most recent account (Domina & Raab-Straube in Euro+Med Plantbase, 2010), 2 species are currently recorded for Armenia: *Cistanche salsa* and *C. fissa*. Karl Koch, during his trips of 1836-1837 to Caucasia, including Georgia and Armenia, collected and described a plant he named *Phelypaea armena*. The label of the lectotype specimen in the St. Petersburg Herbarium (LE) – a duplicate of the original in Berlin, destroyed by war action – bears his handwritten note: "*Phelypaeae salsae* et *fissae* proxima, ut videtur nova. In salsis ad Araxem legit Dr Koch 1837". Perhaps due to lack of material for study, subsequent authors considered *Phelypaea armena* as synonymous with *C. salsa* and dropped it from use. While preparing a revision the genus for the second edition of Flora of Armenia, I found that Koch's taxonomic intuition had been correct. Field and herbarium studies demonstrated that the plants occurring along the Arax river, while doubtless belonging to the genus *Cistanche* as currently circumscribed (thick, unbranched stems, calyces with equal, obtuse lobes, actinomorphic or but slightly zygomorphic corollas lobes), is distinct from *C. salsa* – for which it had generally been mistaken – by the size of its thickened stem base, its scale-like leaves, a divergent inflorescence structure and the color of its corollas. I therefore confidently resurrect Koch's species from oblivion, using the epithet of its name in the new combination *Cistanche armena* (K. Koch) M. V. Agab.

An updated checklist and analysis of thirty four families from the Libyan flora

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The Libyan flora is currently recorded in a series of volumes published between 1976 and 1989. Since then there has been substantial realignment of family boundaries and the discovery of new species. The lack of update or revision since 1989 means that the Libyan Flora is now out of date and requires reassessment using modern approaches so that current estimates of biodiversity can be made and that the conservation status of species can be estimated. Here we report initial efforts to provide an updated checklist covering 34 families that contains 118 genera and 284 species. Updating the current flora reveals that the names of nine families *Tiliaceae, Sterculiaceae, Bombacaeae, Guttiferae, Coridaceae, Vahliaceae, Leonticaceae, Globulariaceae* and *Illecebraceae* have been changed and they have been included in their new families in APGIII. Three families; *Clusiaceae, Adoxaceae* and *Cleomaceae* are new records for Libyan Flora.

Karyotype analysis of *Polygonatum* species (*Asparagaceae*) in Turkey

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The genus *Polygonatum* L. (*Asparagaceae*) comprises 57 species distributed in the temperate regions of the Northern Hemisphere, mainly from the Himalayas to Japan. It is represented by 5 species in Turkey. In this study, the karyotypes of 26 populations belonging to 5 species of *Polygonatum* from Turkey were analysed. Their chromosome numbers were as follows: *Polygonatum glaberrimum* C. Koch. and *P. latifolium* (Jacq.) Desf. 2*n*= 20; *P. multiflorum* L. and *P. orientale* Desf. 2*n*= 18; *P. verticillatum* L. 2*n*= 28. Karyotype analysis showed that the karyotypes of these species consist of metacentric (m), submetacentric (sm), telocentric (t) and subtelocentric (st) centromered chromosomes. Basic chromosome numbers are *x*=10, *x*=9 and *x*=7. Karyotypes of the Turkish species are examined for the first time that collected from wild population in Turkey.

A rare and endemic *Pimpinella* species from Turkey: *P. sintenisii*

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Pimpinella sintenisii Wolff represents a rather critical and still not deeply investigated species within the genus *Pimpinella*. The species belongs to the having yellow petals of the genus. *Pimpinella* is one of the largest genera (125 sp.) among the members of *Apiaceae*. This genus is mainly distributed through subtropical and temperate regions of the northern hemisphere, and the Mediterranean region is one of the most important centres of diversity for this group. *Pimpinella sintenisii* was firstly collected and described by Sintenis in 1888 as *Reutera intermedia*, and then the species was moved to the *Pimpinella* genus by Wolff. This plant is a typical orophyte, occurs on rocks cerevices and has very narrow distribution (Mardin and Siirt provinces in Turkey).

Although *P. sintenisii* is specified that are also occur in Northern Iraq in the Flora of Turkey. The specimen of N Iraq was named *P. sintenisii* var. *cinerea* Blakelock was published as a new species "*P. nephrophylla* Rech. F. H. Rieldl" in 1961. As a result, *P. sintenisii* was considered as an endemic species from Southeastern region of Turkey.

On the basis of field and herbarium investigations, as well as literature, *P. sintenisii* can be considered a species complex, including several allied species such as *Pimpinella nephrophylla* Rech.f. & Riedl, *Pimpinella paucidentata* V.A.Matthews and *Pimpinella flabellifolia* (Boiss.) Benth. ex Drude are also examined.

The present study aims at clarifying the taxonomy, nomenclature, and typification of *P. sintenisii*. A comprehensive study has been carried out in this species in respect of morphology, anatomy, caryology and fruits. A distribution map of this species is also given.

Contribution al' étude la flore halophile des zones humides de la région d'Oran

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La flore halophile occupe une place importante dans le règne végétale. A la différence des glycophytes, les halophytes ne peuvent se développer complètement qu'en présence de sel.

Ce travail est une contribution à l'étude de la flore et la végétation halophiles des zones humides continentales de la région d'Oran. Connus pour leur biodiversité faunistique et floristique, elles sont pour la majorité classées selon la convention Ramsar (1971).

Pour notre travail nous avons étudié les ceintures de végétations halophiles qui entourent la sebkha d'Oran, daya Morsli, les salines d'Arzew et le lac Telamine (04) zones humides de la région d'Oran. Caractérisées par Bioclimat aride et semi-aride à hiver chaud du thermo méditerranéen.Un Sol de type Solontchak et une Végétation dominée par les halophytes.

Pour cela, nous avons réalisé 52 relevés phytoécologiques répartis à travers toute la région, comportant les conditions stationnelles (altitude, exposition, recouvrement…) et la liste des espèces présentes. Après identification nous avons reconnu 140 taxons relevant de 32 familles. Ces relevés ont fait l'objet d'un traitement statistique (AFC, CAH). Ce traitement nous a permis de distinguer 5 groupements végétaux :

- *Limonium gummiferum* et *Inula crithmoides*, sur sols à inondation temporaire,
- *Salicornia europea* et *Suaeda maritima*, sur sols salés,
- *Juncus maritimus* et *Spergularia salina*, sur sols moins salés et restant humide en été,
- *Arthrocnemum macrostachyum* et *Salicornia fruticosa*, sur les sols les plus salés,
- *Atriplex halimus* et *Suaeda fruticosa*, sur les sols moyennement salés.

Nous avons rattaché ces groupements à 3 classes phytosociologiques. L'analyse floristique nous a permis également de mettre en valeur la série de végétation halophile par la présence d'espèces méditerranéennes et d'espèces endémiques de la région d'Oran.

Grace à leur remarquable tolérance à de très fortes concentrations de sel, les halophytes présentent un intérêt d'une importance capitale et d'actualité. La préservation des Zones Humides d'Oran présente un défi national pour la bonne conservation de notre patrimoine biologique (floristique +ornithologique) par l'application et respect de la convention Ramsar.

Ex-situ conservation of *Thermopsis turcica* in Nezahat Gökyiğit Botanic Garden, Turkey

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In this study, morphological properties of critically endangered (CR) *Thermopsis turcica* Kit Tan, Vural & Küçükhödük distributed around Aksehir Lake (38° 30' N and 31° 18' E) and Eber Lake (38° 36' N and 31° 14' E) are investigated. The goal is to determine the taxonomic status of *Thermopsis turcica* by examining morphological properties and to help prospective plants conservation and plant breeding studies.

Thermopsis turcica (Piyan) is an endemic perennial herb with large rhizome in the East Mediterranean region. *Thermopsis* is a genus confined to the Central Asia and the East United States, and it is represented by only one endemic species, *T. turcica* in Turkey. The unique character of *T. turcica* is the uniform occurrence of three free carpels. The polycarpellary condition of *T. turcica* is a clearly derived, rather than a primitive character since the whole Papilionoid pollination syndrome has obviously evolved around the presence of a single median carpel (Davis & al. 1988, Kit & al.1983). Although presence of polycarpellary condition has been previously documented in normal members of the *Mimosoideae* and *Caesalpinoideae*, apart from teratological forms, this is the first record in the *Faboideae* (Kit & al. 1983).

Piyan included in plants protection projects of Nezahat Gökyiğit Botanic Garden collections in 2009. For this purpose, we created *ex–situ* conservation area named "Piyan Conservation Area" in the central island of our garden. As part of the conservation project, which is intensifying since 2010, morphological characterization was researched in the Piyan Conservation Area. In morphological studies, metric measurements were taken on root, stem, leaf, flower, fruit, petiole and seed of 20 specimens. The outcomes are compared with the morphological characterization research which is done for the individual species in the area.