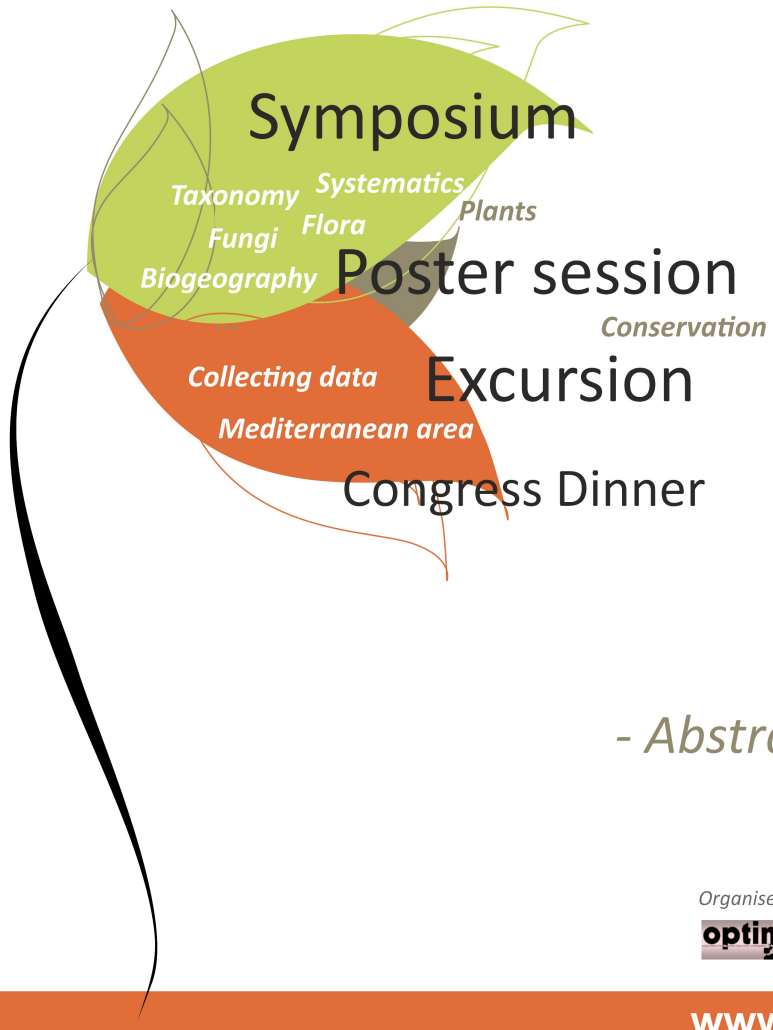
XV OPTIMA Meeting

June 6-11, 2016

MONTPELLIER

Organization for the Phyto-Taxonomic Investigation of the Mediterranean Area



- Abstracts -

Organised by:

optima · Tela Botanica · Conservatoire Botanique National Méditerranéen PORQUEROLLES

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XV OPTIMA Meeting

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Abstracts

Oral presentations
Poster presentations

Montpellier (France), 6-11 June 2016

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

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

XV OPTIMA MEETING

Montpellier (France), 6-11 June 2016

Abstracts

Oral presentations, Poster presentations

Editors: Frédéric Médail & Gianniantonio Domina
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Scientific programme

SUNDAY 5 JUNE / DIMANCHE 5 JUIN

10:30-18:00: Meetings of the OPTIMA Commissions (restricted) / Commissions de OPTIMA (accès restreint)
14:00-18:30: Welcome of participants / Accueil des participants

MONDAY 6 JUNE / LUNDI 6 JUIN

8:30-10:00: Meeting of the Executive Council (restricted) / Réunion du Conseil exécutif (accès restreint)
10:00-11:30: Meeting of the International Board (restricted) / Réunion du Conseil international (accès restreint)

8:30: Reception of participants / Accueil des participants
10:00-11:00: S. Amigues: Théophraste et l'émergence d'un savoir botanique

11:00-11:30: Break / Pause

11:30-12:30: **Opening ceremony** (speakers: OPTIMA President and Secretary, President of the University of Montpellier, Mayor of Montpellier, Representative of the MPLR Region) **/ Cérémonie d'ouverture** (intervenants: Bureau OPTIMA, Président de l'Université de Montpellier, Maire de Montpellier, Représentant de la Région MPLR)

13:00-14:30: Buffet

Lecture Hall 1 / Salle 1:
14:30-18:00: **Symposium 1 – Botanical systematics and taxonomy in France: recent insights / Systématique et taxinomie végétales en France : avancées récentes**
Chairman / Président de session: **V. Malécot** (Institut de Recherche en Horticulture et Semences, Angers, France)

- V. Malécot: Introduction: Botanical systematics and taxonomy in France: an overview of activities and actors. / La systématique et la taxinomie végétales en France : un survol des activités et des acteurs
- J.-M. Tison, B. de Foucault, P. Jauzein, E. Véla, D. Mercier & H. Michaud: The new French floras: *Flore de la France méditerranéenne continentale* and *Flora Gallica*
- D. Mercier: Les kleptons dans le genre *Rosa* (*Rosaceae*): un nouveau concept d'espèce

16:15-16:45: Coffee break / Pause café

- J.-M. Bellanger: Concepts d'espèce en mycologie
- J.-P. Reduron, S. Huet & E. Geoffriau: Avancées des connaissances sur les *Daucus* (*Apiaceae*) de Corse : aspects morphologiques aux stades plantule et adultes
- L. Hardion, R. Verlaque & B. Vila: The man and the reeds: a taxonomic tale on the genus *Arundo* (*Poaceae*)

Lecture Hall 3 / Salle 3:
14:30-18:00: **Symposium 2 – The Mediterranean marine algae / Les algues marines méditerranéennes**

Chairwoman / Présidente de session: **A. Gómez** (University of Barcelona, Spain)

- B. Reviers de, F. Rousseau & T. Silberfeld: New insights into brown algal classification
- C. Rodríguez-Prieto: Reproductive morphology in taxonomy of red algae

16:15-16:45: Coffee break / Pause café

- V. Peña Freire: Taxonomy of coralline red algae: insights from an integrative systematic approach
- T. Thibaut: The decline of marine forests

Lecture Hall 2 / Salle 2:

14:30-18:00: **Symposium 3 – Plant conservation in France, *in situ* approaches / Conservation de la biodiversité végétale en France, approches *in situ***

Chairman / Président de session: **J. Thompson** (CEFE/CNRS, Montpellier, France)

- K. Diadema**,** V. Noble, M. Pires, M. Le Berre, G. Casazza, L. Minuto, M. Mariotti, J. Van Es, S. Abdulhak, N. Fort & F. Médail: Priority species and sites for plant conservation in the Mediterranean Alps: an example of a cross border approach
- P. Grillas**,** L. Martinez, H. Michaud, B. Offerhaus, N. Borel & J. Molina: Enjeux de conservation de la flore aquatique et méconnue sur des sites industriels: les genres *Riella* (*Riellaceae*), *Tolypella* (*Charophyceae*) et *Althenia* (*Potamogetonaceae*)
- Y. Petit**,** C. Piazza, A. Delage, G. Paradis, F. Médail, B. Schatz & L. Hugot: La diversité des actions de conservation pour la flore de Corse

16:15-16:45: Coffee break / Pause café

- S. Muller: Les translocations réalisées dans le cadre des demandes de dérogation à l'interdiction de destruction de plantes protégées en France : contextes, intérêts et limites
- L. Affre, P. Mirleau, I. Laffont-Schwob, L. Le Mire-Pécheux, C. Guiller, A. Baumel, F. Torre & L. Miché: Opération pilote de renforcement des populations d'*Astragalus tragacantha* (*Fabaceae*) dans le Parc National des Calanques (Sud de la France)
- G. Papuga, P. Gauthier, E. Farris & J. D. Thompson: Ecological originality and genetic isolation: the conservation significance of peripherally isolated populations in Mediterranean France

18:00-20:00: Open workshop / Groupe de travail ouvert: "**Advances and organization of one Flora of Algeria and Magreb on the Web / Avancée et organisation d'une Flore d'Algérie et du Maghreb sur le Web**" – Information and contact / Renseignements et contact: cyrille.chatelain@ville-ge.ch

TUESDAY 7 JUNE / MARDI 7 JUIN

Lecture Hall 1 / Salle 1:

9:00-12:30: **Symposium 4 – Advanced methods in plant systematics / Avancée des méthodes en systématique végétale**

Chairmen / Présidents de session: **C. Oberprieler** (University of Regensburg, Germany) & **K. Marhold** (Institut of Botany, Bratislava, Slovakia)

- S. Peccenini, D. Dagnino, F. Grassi, G. Casazza & L. Minuto: An integrative taxonomic approach in the genus *Erysimum* (*Brassicaceae*)
- G. Astuti, F. Roma-Marzio & L. Peruzzi: Traditional cytotaxonomic studies: can they still provide a solid basis in plant systematics?
- N. G. Passalacqua & F. J. Rohlf: Limits and potentiality of geometric morphometrics in plant systematics

10:45-11:15: Coffee break / Pause café

- B. Frajman, C. Bertel, K. Huelber, E. Trucchi, O. Paun & P. Schönswetter.: Environmentally induced phenotypic variation and recurrent ecological speciation in the *Heliosperma pusillum* group (*Caryophyllaceae*)
- S. Tomasello, F. Wagner & C. Oberprieler: Using the multispecies coalescent model to infer species tree/networks and species delimitations

Lecture Hall 2 / Salle 2:

9:00-12:30: **Symposium 5 – The changing role of botanic gardens in the Mediterranean / L'évolution du rôle des jardins botaniques en Méditerranée**

Chairmen / Présidents de session: **F. M. Raimondo** (University of Palermo, Italy) & **V. H. Heywood** (University of Reading, UK)

- G. Domina & C. Salmeri: The changing role of botanic gardens in the Mediterranean
- G. Nieto Feliner: Challenges faced by urban botanic gardens in the Mediterranean
- O. Fragman Sapir: Development of new ornamentals, conservation and research in botanic gardens

10:45-11:15: Coffee break / Pause café

- C. Ducatillion, R. Bellanger, A. Gili & J. Thévenet: Le rôle continu des jardins botaniques méditerranéens dans l'introduction de plantes
- S. Lochon-Menseau & V. Noble: Les conservatoires botaniques nationaux en France: nouveaux modèles pour la Méditerranée

Lecture Hall 1 / Salle 1:

14:30-18:00: **Symposium 6 – Biogeography and conservation of the flora of the small Mediterranean islands / Biogéographie et conservation de la flore des petites îles de Méditerranée**

Chairman / Président de session: **F. Médail** (IMBE, Université Aix-Marseille, France)

- F. Médail: The Small Mediterranean islands Initiative (PIM Initiative) and some insights on plant biodiversity and conservation assessment of the small islands of Eastern Tunisia
- G. Bacchetta, M. Fois & G. Fenu: Small Mediterranean islets as "modern refugia" of plant biodiversity from human pressures: the importance of local studies for conservation planning
- S. Pasta: Insights on the species-richness and on the biogeographic and conservation interests of the vascular flora of circum-Sicilian islands

16:15-16:45: Coffee break / Pause café

- E. Véla: Contribution de l'Initiative PIM à la connaissance de la biodiversité végétale des petites îles d'Algérie
- M. Panitsa, P. Dimopoulos & I. Kokkoris: Species-based *versus* habitat-based conservation status assessment of the phytodiversity in the Aegean islands (Greece)

Lecture Hall 2 / Salle 2:

14:30-18:00: **Symposium 7 – Lichens biodiversity exploration in the Mediterranean region / L'exploration de la diversité des lichens dans la région méditerranéenne**

Chairwoman / Présidente de session: **A. R. Burgaz Moreno** (University Complutense of Madrid, Spain)

- L. Muggia**,** F. Fernández-Mendoza & M. Grube: Lichens as niche for black fungi
- F. Fernández-Mendoza, I. Frolov, J. Vondrak, J. Rabensteiner, T. Kopun, L. Muggia, H. Mayrhofer & M. Grube: A phylogenetic insight into the diversification of saxicolous black fruited Caloplacas in Eurasia (*Pyrenodesmia*, *Teloschistaceae*)

16:15-16:45: Coffee break / Pause café

- A. R. Burgaz, R. Pino-Bodas & T. Ahti: The Mediterranean *Cladoniaceae*: problems and advances
- E. Llop: Saxicolous lichen diversity in the Mediterranean Basin: an overview of calcicolous communities from Malta

Lecture Hall 1 / Salle 1:

18:00-19:00: **Symposium dedicated to Pierre Quézel / Symposium dédié à Pierre Quézel**

- F. M. Raimondo: Introduction
- F. Médail: Pierre Quézel (1926-2015), une oeuvre scientifique entre Méditerranée et Sahara

WEDNESDAY 8 JUNE / MERCREDI 8 JUIN

9:00-13:00: **Poster session**, posters will be dispalyed for the whole congress / **Session de présentation des posters**, les posters étant affichés durant l'ensemble du congrès

10:45-11:15: Coffee break / Pause café

Lecture Hall 1 / Salle 1:

14:30-18:00: **Symposium 8 – *Ex situ* conservation in Mediterranean France/ La conservation *ex situ* de la biodiversité végétale en France méditerranéenne**

Chairman / Président de session: **B. Khadari** (CBNMed-SupAgro-INRA, Montpellier, France)

- P.-O. Cheptou: Utilisation des banques de graines pour étudier l'évolution contemporaine
- L. Dixon: Stratégie et perspectives en conservation *ex-situ* en France méditerranéenne continentale
- L. Essalouh, J. Molina, J.-M. Prosperi, J.-L. Pham & B. Khadari: Partenariat Conservatoires botaniques nationaux-ARCAD et conservation *ex-situ*: vers des études sur l'évolution des traits de vie et la phylogéographie de la flore méditerranéenne

16:15-16:45: Coffee break / Pause café

- J. Dubois & N. Fort: Evolution spatiale et temporelle de la régénération séminale de plantes patrimoniales des Alpes du Sud
- G. Bacchetta, A. Santo, M. Orrù, M. Ucchesu, R. Picciau, M. Sarigu, A. Cuena Lombraña, S. Sau & M. Porceddu: Innovative perspectives of the Sardinian Germplasm Bank (BG-SAR) for the preservation of Mediterranean plant diversity
- T. Ulian: Conserving plant diversity and improving livelihoods: examples from the Mediterranean region, Africa and Latin America

Lecture Hall 2 / Salle 2:

14:30-18:00: **Symposium 9 – New advances in bryophytes research in the Mediterranean region / Nouvelles avancées des recherches sur les bryophytes en région méditerranéenne**

Chairwoman / Présidente de session: **R. María Ros** (University of Murcia, Murcia, Spain)

- D. Lamy: Histoire de la bryologie en France et contributions des bryologistes français aux recherches en région méditerranéenne
- V. Spagnuolo: *Sphagnum* (*Sphagnaceae*) in the Mediterranean Basin: Relict populations worthy of protection
- O. Werner, S. Pisa, S. Rams, M. Saavedra, M. Nieto-Lugilde & R. M. Ros: Insights into the landscape genetics of some common mosses

16:15-16:45: Coffee break / Pause café

- M. Kirmaci: Turkey, an important harbour for Bryophytes in the Mediterranean basin

- R. Gabriel, P. A. V. Borges, P. Cardoso, O. Flores, J. M. González-Mancebo, T. Hedderson, S. C. Aranda, M. C. M. Coelho, D. S. G. Henriques, R. Hernández-Hernández, M. Lovanomanjanahary, N. Wilding & C. Ah-Peng: Epiphytic bryophytes on islands: elevation patterns across different archipelagos

18:00-20:00: Open workshop / Groupe de travail ouvert : "**Round trip from Red List data to *in situ* conservation of Important Plant Areas**" / "**De la Liste rouge à la conservation *in situ* des Zones Importantes pour les Plantes : un voyage aller-retour**" – Information and contact / Renseignements et contact: violeta.barrios@iucn.org

THURSDAY 9 JUNE / JEUDI 9 JUIN

8:00-18:00

Mid-Congress Excursion to the plateau of Larzac / Excursion de mi-congrès sur le Causse du Larzac

FRIDAY 10 JUNE / VENDREDI 10 JUIN

Lecture Hall 1 / Salle 1:

9:00-12:30: **Symposium 10 – Speciation by hybridization and polyploidy in the Mediterranean / Spéciation par hybridation et polyploïdie en Méditerranée**

Chairmen / Présidents de session: **K. Marhold** (Institut of Botany, Bratislava, Slovakia) & **S. Siljak-Yakovlev** (Université Paris-Sud, Orsay, France)

- T. Mandáková, A. Kovařík, M. A. Lysak, K. Marhold: Patterns of genome evolution in the genus *Cardamine* (*Brassicaceae*)
- M. Ainouche, A. Baumel, B. Gallego-Tevar, J. Castillos, M. Rousseau-Gueutin, J. Boutte, J. Ferreira de Carvalho, O. Lima, A. Kovarick, A. Leitch, I. Leitch, A. Ainouche & A. Salmon: Unending hybridization and polyploid speciation stories: lessons from *Spartina* (*Poaceae*)
- S. Demirci, N. Özhatay Fatma: Polyploidy and karyotype variation in the bulbous genera (*Hyacinthaceae*) from Southern Turkey

10:45-11:15: Coffee break / Pause café

- M. Lazarević, V. Stevanović, B. Stevanović, T. Robert, S. Siljak-Yakovlev: Refugial plant survival: role of polyploidy and hybridization in the evolution of resurrection plants of the genus *Ramonda* (*Gesneriaceae*)
- J. Pellicer, O. Hidalgo, D. Vitales , J. Vallès, A. Santos-Guerra, A. García, S. Siljak-Yakovlev, T. Garnatje: Cytogenetic insights into plant diversification: *Asteraceae* as a case study

Lecture Hall 2 / Salle 2:

9:00-12:30: **Symposium 11 – Urban plant diversity in the Mediterranean / La diversité botanique dans les villes méditerranéennes**

Chairman / Président de session: **V. H. Heywood** (University of Reading, UK)

- V. H. Heywood: The nature and composition of urban plant diversity in the Mediterranean
- S. L. Jury: Plant diversity in Mediterranean parks and gardens
- F. M. Raimondo: L'impact du vert urbain sur le niveau de la diversité végétale

10:45-11:15: Coffee break / Pause café

- K. Perini: Green roofs and living walls – benefits and challenges
- P. Fraga: Sustainable gardening and increasing invasive species, a paradox

Lecture Hall 1 / Salle 1:

14:30-18:00: **Symposium 12 – The flora of the Irano-Turanian region: new biogeographical perspectives and conservation / La flore de la région irano-touranienne: nouvelles perspectives en biogéographie et conservation**

Chairwoman / Présidente de session: **M. Bou Dagher-Kharrat** (Saint-Joseph University, Beirut, Lebanon)

- S.-W. Breckle: Iconographic floras and checklists - a tool for future research in the Irano-Turanian floristic region
- S. Youssef, A. Mahmood, H. Mahdi & E. Vela: Vegetation structure and diversity of the Irano-Turanian flora in the Kurdistan Region (N-Iraq)
- R. Riina & I. Sanmartín: Biogeography and diversification of *Euphorbia* subg. *Esula* (*Euphorbiaceae*): a species-rich lineage centered in the Irano-Turanian and Mediterranean regions

16:15-16:45: Coffee break / Pause café

- S. Remal, K. Aktaş, C. Pélissier & L. Civeyrel: Phylogenetic analyses of the Mediterranean genus *Verbascum* (*Scrophulariaceae*) inferred from cpDNA and nrDNA data compared to morphological data
- F. Moharrek, S. Kazempour Osaloo, I. Sanmartín & G. Nieto Feliner: A phylogenetic and biogeographic study of the speciose Irano-Turanian genus *Acantholimon* (*Plumbaginaceae*)
- S. Manafzadeh: Visions of the past and dreams of the future in the Orient: the Irano-Turanian region from classical botany to evolutionary studies

Lecture Hall 2 / Salle 2:

14:30-18:00: **Symposium 13 – The role of amateur networks in Mediterranean botany / Le rôle des réseaux de botanistes amateurs en région méditerranéenne**

Chairman / Président de session: **J. Mathez** (Université de Montpellier, France)

- A. Baglivo M. Zepigi, C. Cibei, G. Nicolella, G. Salvai, D. Longo, G. Dose, F. Giordana, A. Alessandrini, D. Tomasi, C. Magni & S. Servodio: Acta Plantarum, an amateur virtual community for the floristic and botanical knowledge sharing
- P. Bernat & L. Vilar: Flora Catalana, un point de rencontre pour les amateurs de la botanique
- L. Peruzzi S. Bagella, R. Filigheddu, B. Pierini, M. Sini, F. Roma-Marzio, K. F. Caparelli, G. Bonari, G. Gestri, D. Dolci, A. Consagra, P. Sassu, M. C. Caria, G. Rivieccio, M. Marrosu, M. D'Antraccoli, G. Pacifico & G. Bedini : The wikiplantbase project : the role of amateur botanists in building up large online floristic databases

16:15-16:45: Coffee break / Pause café

- D. Mathieu & P. Cellier: Tela Botanica, le réseau des botanistes francophones
- J. Molina & G. De Barros: Les sciences participatives au service du Système d'Information sur la Nature et les Paysages (SINP)
- R. Meddour, R. El Mokni & E. Véla: L'arrivée des amateurs dans les réseaux botaniques : l'expérience de Tela Botanica en Algérie et Tunisie

19:30: Congress dinner at the *Maison des Relations Internationales* / Dîner de gala à la *Maison des Relations Internationales*

SATURDAY 11 JUNE / SAMEDI 11 JUIN

Lecture Hall 1 / Salle 1:

9:00-12:30: **Symposium 14 – The impact of fire on the Mediterranean vegetation / L'impact du feu sur les végétations méditerranéennes**

Chairman / Président de session: **B. Valdés** (University of Seville, Spain)

- B. Valdés: General introduction
- C. Carcaillet: Post-fire biodiversity dynamics of plant communities in the Mediterranean forests
- R. Meddour, O. Meddou-Sahar & H. Hamel: Analyse de la dynamique post-incendie du la série de chêne liège (*Quercus suber*, *Fagaceae*) de la forêt domaniale de Mizrana (wilaya de Tizi-Ouzou, Algérie)
- I. Camarda, L. Carta & G. Vacca: Incendie, pâturage et biodiversité dans la montagne du Gennargentu (Sardaigne)

10:45-11:15: Coffee break / Pause café

- E. Batllori: The interacting effects of fire and drought on the dynamics of Mediterranean ecosystems
- J. de las Heras Ibáñez: Post fire restoration of Mediterranean forests: helping autosuccession

Lecture Hall 2 / Salle 2:

9:00-12:30: **Symposium 15 – Useful plants of the Mediterranean / L'usage des plantes en Méditerranée**

Chairman / Président de session: **K. Hüsnü Can Başer** (Anadolu University, Eskisehir, Turkey)

- N. Mimica-Dukić, E. Jovin & D. Orčić: Native plants in Serbia as a source of new antiinflammatory agents - the case of the *Polygonaceae* family
- İ. Çaliş: Results from the studies performed on Eastern Mediterranean *Lamiaceae*
- D. Rivera Nuñez & C. Obón de Castro: Useful plants of Southern Europe

10:45-11:15: Coffee break / Pause café

- S. Cañigueral & R. Vila: Useful Mediterranean aromatic plants and essential oils
- G. Domina: Useful plants and landscape changes in the Mediterranean area

Lecture Hall 1 / Salle 1:

14:00-17:00: **Symposium 16 – Mediterranean plants phylogeography / Phylogéographie des plantes méditerranéennes**

Chairmen / Présidents de session: **Y. Naciri** (Conservatoire et Jardin Botanique de Genève, Switzerland) & **A. Baumel** (IMBE, Université Aix-Marseille, France)

- H. P. Comes & M. Affenzeller: Parallel bursts of recent and rapid radiation in the Mediterranean and Eritreo-Arabian biodiversity hotspots as revealed by *Globularia* and *Campylanthus* (*Plantaginaceae*)
- J. Migliore, A. Baumel, A. Leriche, M. Juin & F. Médail: Inferring refugia and migration process of a Mediterranean thermophilous shrub in response to past climate changes
- N. Arrigo: Hybridization in the *Triticum-Aegilops* species complex (*Poaceae*)

15:45-16:00: Coffee break / Pause café

- Y. Naciri, P.-E. Du Pasquier & D. Jeanmonod: *Silene* species (*Caryophyllaceae*) of the Mediterranean Basin: is there any difference between East and West for phylogeographic and speciation patterns?
- G. Nieto Feliner: Phylogeographic patterns in the Mediterranean region. An update

Lecture Hall 2 / Salle 2:

14:00-17:00: **Symposium 17 – Alien invasive species in the Mediterranean / Espèces végétales exotiques envahissantes en Méditerranée**

Chairmen / Présidents de session: **S. Brunel** (International Plant Protection Convention, Rome, Italy) and **G. Fried** (Anses, Montferrier-sur-Lez, France)

- E. Branquart, S. Vanderhoeven, T. Adriaens: Science for the new European Regulation on invasive alien species

- T. Le Bourgeois: Improving management of weeds through a combination of participatory approach using citizen science and ICT tools
- G. Fried, P. Cellier, A. Tocco, C. Vignau, D. Mathieu: Toward a Citizen Observatory on Invasive Plants

15:45-16:00: Coffe break / Pause café

- G. Brundu: Engaging the public in the management and control of invasive alien plants in the Mediterranean region: the LIFE project Puffinus in Tavolara (Italy)
- R. Meddour & R. El Mokni: État de l'art sur les plantes envahissantes ou à caractère invasif introduites en Algérie et en Tunisie

Lecture Hall 1 / Salle 1:

17:00-18:00: Closing ceremony and General meeting of OPTIMA / Cérémonie de clôture et assemblée générale d'OPTIMA

Oral presentations

The new French floras: Flore de la France méditerranéenne Continentale and Flora Gallica

J.-M. Tison[1], B. Foucault de[2], P. Jauzein[3], E. Véla[4], D. Mercier[5] & H. Michaud[6]

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The two new French floras, "Flore de France méditerranéenne continentale" (abbreviated "Flore Med") and "Flora Gallica", were published few months apart in 2014. The first one covers the territory of accreditation of the CBNMED: the former region Languedoc-Roussillon and a part of Provence-Alpes-Côte-d'Azur, whereas the second one covers all France. Flore Med is less up to date because of editorial problems, but more pleasant to use.

The scope of both books is the determination of the plants normally found outside houses and gardens. Accordingly, they keys include native, naturalized, and large-scale cultivated taxa, including crops and reforestation trees. The casual species and the trees planted alone in woods are just cited in lists, for two reasons: i) their analytic treatment could lead to inordinately increase the flora almost without profit, ii) the casual species of tomorrow are not those of yesterday. The species mistakenly cited in the area are also reported. The total treatment in France (Flora Gallica) includes 5351 native species and 709 naturalized and large-scale cultivated species.

Particular attention was paid to the precision of the vocabulary. Examples are the terminology of the division of leaves, or the status of alien plants.

The basic taxonomic reference is Euro+Med. However, different viewpoints have been chosen when the E+M treatment was old or lacking, or when recent taxonomic publications or personal works of the author(s) have brought a new approach. A few errors were committed by following blindly the recent E+M database, for instance in the splitting of *Bromus*.

- *Hieracium*, *Taraxacum*, *Alchemilla* and *Gagea* sect. *Didymobulbos*, almost strictly apomictic and reticulate, are treated in exhaustive mode, or semi-exhaustive for *Hieracium* in Flora Gallica because the high number of taxa. Although *Hieracium* is obviously strongly reticulate, Zahn's filiation assumptions are abandoned as too speculative.
- *Rubus*, mainly apomictic and reticulate, has only an approach through morphological clusters due to the lack of knowledge of the French taxa.
- *Ranunculus auricomus* aggr. is not developed because the lack of described taxa and chiefly the usual presence of a residual sexuality leading to many intermediate forms.
- *Rosa* has a very innovative approach based on a zoological concept (kleptons) developed by D. Mercier.
- The treatments of the critical orchid genera *Dactylorhiza*, *Epipactis*, *Ophrys*, and *Serapias*, by E. Véla, follow mostly the available genetic and biological data than the usual ultra-splitting treatments of the amateur's literature.

Les kleptons dans le genre *Rosa* (*Rosaceae*): un nouveau concept d'espèce

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Dans le cadre de ma collaboration à l'ouvrage *Flora gallica* (Tison & de Foucault (eds.), 2014), et en tenant compte des travaux les plus récents, j'ai proposé une nouvelle base théorique à l'étude de la taxonomie des espèces contenues dans la section *Caninae* DC. du genre *Rosa* L.

Les *Rosa* de la section *Caninae* présentent en effet un mode de reproduction particuliers qui a déjà été détecté chez divers animaux (batraciens, poissons, etc.), mais chez aucune autre plante à ce jour : il s'agit d'une reproduction sexuée impliquant un apport asymétrique du nombre de chromosomes par les gamètes mâles et femelles.

En effet, chez *Rosa* sect. *Caninae*, le gamète mâle apporte à la cellule œuf uniquement un lot de 7 chromosomes qui s'apparient lors de la fécondation à 7 chromosomes du gamète femelle (il s'agit de chromosomes bivalents). D'après des expériences de croisements contrôlés, ces chromosomes bivalents portent des gènes codants pour seulement certains caractères morphologiques, comme l'orientation et la persistance des sépales, le diamètre de l'orifice du disque, l'allongement des axes, mais ils ne codent (presque) jamais pour des caractères foliaires. Le gamète femelle apporte également à la cellule œuf entre 2 et 4 lots de 7 chromosomes qui ne s'apparient pas (appelés chromosomes univalents). D'après des expériences de croisements contrôlés, ces chromosomes univalents codent notamment pour la (quasi) totalité des caractères foliaires.

La nouvelle base théorique proposée dans *Flora gallica* est de faire porter l'intégrité spécifique en totalité par ces chromosomes univalents qui sont stables d'une génération à l'autre (de la plante porte graine au descendant). Et de considérer les chromosomes bivalents comme interchangeables et extérieurs à l'espèce. Cette façon de voir correspond tout à fait au concept du klepton développé en biologie animale. Dans *Flora gallica*, ce concept est pour la première fois étendu au règne végétal.

Chez les *Rosa* sect. *Caninae*, cette nouvelle approche implique de revoir la compréhension des limites de ces espèces à biologie particulière appelées kleptons, en prenant davantage en compte les caractères foliaires, et en laissant de côté, dans un grand nombre de cas, les variations d'autres caractères habituellement utilisé pour justifier de la valeur d'une espèce, tels que l'orientation et persistance des sépales, et le diamètre de l'orifice du disque. Sur ces nouvelles bases théoriques et pratiques, la taxonomie de ces plantes est donc à réétudier.

Concepts d'espèce en mycologie

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Par la nature discrète de leur appareil végétatif et la fugacité de leurs fructifications, les champignons représentent la moins bien connue des trois grandes lignées d'eucaryotes. La complexité de leurs modes de vie et de reproduction n'a pas permis, comme en botanique ou en zoologie, la définition d'un concept d'espèce biologique opérationnel en mycologie. A la place, c'est sur la combinaison de caractères morpho-anatomiques des fructifications, jugés suffisamment stables d'un point de vue taxinomique, que s'est fondé le concept d'espèce fongique. L'arrivée relativement récente des techniques moléculaires en mycologie constitue probablement le plus important bouleversement qu'ait connu la discipline depuis ses origines, en révélant, outre l'histoire évolutive de chaque taxon, la pertinence des critères taxinomiques utilisés jusque-là pour en décrire toute la diversité ainsi que les limites naturelles – i.e. évolutives – des espèces de champignons, y compris de celles asexuées ou ne produisant pas de fructifications. Dans la pratique, l'analyse phylogénétique conduit à 1) établir ou confirmer l'autonomie d'espèces morphologiques, ou au contraire à 2) reconsidérer la distinction d'espèces auparavant différenciées sur des bases morphologiques ou écologiques, ou 3) à révéler l'existence d'espèces cryptiques au sein d'une espèce morphologique. Au travers d'exemples choisis parmi ses travaux les plus récents, l'auteur illustre la puissance mais aussi les limites de l'outil phylogénétique en taxinomie fongique. Il pointe aussi du doigt la nécessaire évolution de la mycologie vers une science intégrative fondée sur un concept morphogénétique de l'espèce, seul capable de concilier l'histoire évolutive de ces organismes avec les besoins opérationnels d'une discipline fondamentalement naturaliste.

Avancées des connaissances sur les *Daucus* (*Apiaceae*) de Corse: aspects morphologiques aux stades plantule et adultes

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Il existe une diversité importante des *Daucus* (*Apiaceae*) de Corse appartenant au complexe spécifique de *D. carota*. Les précédents résultats ont montré une nette isolation génétique en Corse par rapport aux populations du continent sur le territoire français. En Corse même, 5 groupes génétiques et 3 isolats ont été différenciés par une analyse des marqueurs microsatellites. Par ailleurs, les populations corses font preuve d'importants échanges de gènes dus à l'interfertilité des taxons, la pollinisation entomophile et une allogamie fortement prédominante. Ces échanges interviennent à la fois entre les populations (interpopulationnels) suivant la distance géographique comme à l'intérieur de celles-ci (intrapopulationnels). Ceci explique la complexité des *Daucus* corses et la difficulté de leur identification. L'objectif du travail présenté est de caractériser les populations corses du point de vue morphologique. Des études de morphologie comparée ont été pratiquées sur une vingtaine de populations au stade adulte comme au stade plantule. Les analyses de diversité et multivariées participent à l'organisation taxonomique tout en confirmant une variabilité morphologique importante au sein des *Daucus* corses.

La difficulté d'établissement d'une taxonomie infraspécifique dans un contexte allogame sympatrique est discutée.

The man and the reeds: a taxonomic tale on the genus *Arundo* (*Poaceae*)

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The genus *Arundo* (*Poaceae*) illustrates the long-term impacts of human activities on biodiversity since the Neolithic. Historically the main genus of reeds, including about 200 taxa and synonyms, *Arundo* has been reduced to three Mediterranean and South-Asian species. To clarify the status of French endangered populations, we led a taxonomic revision melting morphometric and phylogenetic data on a wide sampling. This study reduced *A. plinii* Turra to an Italo-Balkan taxon, and rehabilitated the circum-Mediterranean *A. micrantha* Lam. and the Ligurian endemic *A. donaciformis* (Loisel.) Hardion *et al*. AFLP fingerprints failed to reveal genetic variability for these two species and for the widespread invasive *A. donax* L. Phylogeographical investigations included *A. donaciformis* within the Italian lineage of *A. plinii,* despite its differentiation as a robust polyploidy clone. We hypothesized the dispersal of this rare taxon by the Romans, explaining its genetic uniformity. The lack of genetic structure and the sterility of *A. micrantha* and *donax* all around the Mediterranean raise questions about their human dispersal. To resolve this hypothesis, we looked for genetic variability and seed production on 126 herbarium specimens of South-Asian *A. donax*. We found caryopses and cpDNA variability in Afghanistan, India, Nepal and China. The invasive clone belongs to a lineage located along the Indus Valley. The Middle-East expansion of the sterile clone could be due to its ancient usefulness and dispersal by Mesopotamian civilisations, inducing its invasion through the Mediterranean Basin thousands of years ago. On the contrary, we failed to find any genetic variation in the circum-Mediterranean *A. micrantha*. However, its geographical location closely matches with the distribution of Phoenico-Punic sites. Finally, the Taiwanese endemic *A. formosana* Hack. was reinforced as a highly differentiated species including three intraspecific taxa. The cpDNA phylogeny of the genus described the initial divergence of *A. formosana*, and then the paraphyly of *A. donax* including a monophyletic clade of Mediterranean taxa. If the systematics of *Arundo* still needs further molecular investigations on a broader sampling, most questions are now turned to archaeological studies to resolve the different impacts of civilisations on the use and dispersal of *Arundo* taxa.

New insights into brown algal classification

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Brown algae (*Phaeophyceae*) are an ecologically important component of marine littoral ecosystems, an economically important bio-resource and an original model of multicellular organisms for research. Recent molecular phylogenetic studies allowed gaining more insight into brown algal suprageneric classification and evolution. New subclasses, orders and families have been proposed. *Discosporangiophycidae* was created to accommodate the recently reinstated *Discosporangiales*. *Ishigeophycidae* was created for *Ishigeales*, the later being extended to include the new family *Petrodermataceae* in addition to *Ishigeaceae*. *Dictyotophycidae* was created for the Sphacelariales-Syringodermatales-Dictyotales-Onslowiales clade. *Lithodermataceae* were formally placed in *Sphacelariales* and the family *Sphacelodermaceae* was created for the new genus *Sphaceloderma*. The 13 other orders constitute the subclass *Fucophycidae* in where which the order of divergence of some lineages remains disputed. In this subclass, the new order *Asterocladales* and the new family *Asterocladaceae* was proposed for the genus *Asterocladon*. The recently described family *Aureophycaceae*, containing the new genus and species *Aureophycus aleuticus*, was either sister to the *Agaraceae* + ALL (Alariaceae-Lessoniaceae-Laminariaceae) clade or sister to the Alariaceae in the analyses and should likely be considered part of a large AAALL clade. In *Scytothamnales*, the new families *Bachelotiaceae* and *Asteronemataceae* were created whereas *Scytothamnaceae* were merged in *Splachnidiaceae*, being defined by its unique stellate plastid with a central pyrenoid immersed in the plastidial stroma. A scenario of plastidome evolution was proposed within this order. The phylogenetic value of plastidome has not been contradict since the proposal, in 1999, that a pedunculate pyrenoid was synapomorphic in *Ectocarpales*; however, the Ectocarpacean genus *Pleurocladia* sounds like an exception from this standpoint and needs TEM investigation: it may have lost the pyrenoid during the course of evolution. A further confirmation of pyrenoid value is the placement of the genus *Platysiphon*, previously thought to be ectocarpalean but possessing plastids devoid of pyrenoid, in the new family *Platisyphonacae*, outside the *Ectocarpales*. *Platysiphonaceae*, together with *Halosiphonaceae* and *Stschapoviaceae* were accomodated in the new order *Stschapoviales*, leading to a consistent new concept of Tilopteridales/Cutleriales. Hopefully, the Phaeoexplorer project which will add complete genome analyses to the present results will still improve our understanding of brown algal classification. At last, several arguments are put forward with respect to inclusion of *Schizocladia* and '*Botryodopsis' pyrenoidosa* in the Phaeophyceae; this is discussed for the former and seems premature pending further analyses for the later.

Reproductive morphology in taxonomy of red algae

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Taxonomy of red algae was primarily based on the morphology of female reproductive structures and the post-fertilization stages, and its foundations were solidly established in the 20th century by the Swedish botanist Harald Kylin. The posthumous treatise of Kylin (1956), which incorporated revisions of the preceding noteworthy works of Schmitz (1889) and Oltmanns (1898), was the basis of the current ordinal classification of *Rhodophyta*, and the starting point for all changes in the classification of red algae at and above the genus level. Besides reproductive features and life histories, many other characteristics and methodologies, including biochemical, ultrastructural and structural features, and culture and molecular techniques, have contributed to building the current classification system for red algae. Within these tools, the development of molecular techniques in the last decades is remarkable because their contribution to most changes on the ordinal and subordinal level. Especially, they have been essential in the classification of the groups classically included within the *Bangiophyceae*, because these organisms lack most of the reproductive features that are used in taxonomy of *Florideophyceae*. Topics that historically made and currently are making major taxonomic and evolutionary contributions to taxonomy of red algae are discussed, stressing on reproductive features. Eventually, a future that merges molecular and reproductive data to build up an increasingly robust phylogeny is predicted.

Taxonomy of coralline red algae: insights from an integrative systematic approach

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Coralline red algae are an important group of benthic macroalgae with a global distribution, from the intertidal down to the limit of the photic zone. They can occur as erect, articulated fronds with alternating calcified and uncalcified segments (geniculate coralline algae), or entirely calcified forms (non-geniculate) attached to the substratum or unattached (maerl/rhodolith). In the Mediterranean, non-geniculate coralline algae function as autogenic ecosystem engineers creating characteristic habitats such as the coralligenous, maerl beds, or the intertidal vermetid reefs and the *trottoir*. Since the beginning of the coralline algae systematics in the XVIIIth century, the European coasts have been extensively sampled, and numerous species were described. In some species, their distributional ranges were extended to both Atlantic and Mediterranean coasts based on morphological studies. Nevertheless, this group shows a high phenotypic plasticity and morphological convergences were found among phylogenetically distant taxa. Recent studies applying an integrative systematic approach that combines molecular data with morphological, ecological and geographic information, detected a high cryptic diversity in this group as well as confusions in taxonomy and biogeography of several species. Here it is presented an updating of the taxonomy of coralline algae with a particular focus on the Mediterranean flora.

The decline of marine forests

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Marine forests constitute the largest biogenic structures found in benthic marine systems of the world's cold-water and temperate coastal habitats. Kelp (*Laminariales*) and fucoid (*Fucales*) forests (*Phaeophyceae*, kingdom *Stramenopile*) are the ecosystem engineers of these marine forests. These long-lived primary producers are among the most productive species worldwide they provide a wide range of ecosystem goods and services, supporting major economic activities (e.g. fisheries, algal harvesting, SCUBA diving). They host a considerable number of species but when disturbed, most of the engineer species have a very slow natural recovery rate. Like other coastal ecosystems, kelp and fucoid forest are highly impacted due to the cumulative effects of increasing human pressure (e.g. destruction of habitats, pollution, non-indigenous species, overfishing, coastal aquaculture and global warming). Different forms of stress act over time and in unison, with a possible synergistic effect, on species, ecosystems and their ability to deliver ecosystem services. The decline of kelp and fucoids is a worldwide phenomenon directly or indirectly resulting from human activities. Some taxa have been driven to regional extinction or are threatened by climate warming that might drive them toward areas where retreat is impossible. These impacts are leading to shifts in habitat structure from a state with canopy forming species to alternative states, in the worst case to barren grounds composed of filamentous and encrusting species, with flow-on effects on adjacent communities (coralligenous habitats, soft substrates, seagrass meadows). In the Mediterranean sea, *Fucales* of the genus *Cystoseira* C. Agardh and *Sargassum* C. Agardh are habitat-forming species dominating several assemblages from the littoral fringe down to the lower sublittoral zone. Loss of Mediterranean fucoid macroalgae has been reported throughout the Mediterranean caused by habitat destruction, eutrophication and overgrazing by herbivores, leading to a shift to lesser structural complexity, such as turf-forming, filamentous or other ephemeral seaweeds or barren grounds where sea urchin density is a driver of habitat homogenization. Without management, this decline seems irreversible in many Mediterranean areas and the remaining forest are under the threat of the arrival in the northern part of the invasive *Siganus*, voracious herbivorous fish known to have deplete the marine forests in the Eastern Mediterranean Sea.

Priority species and sites for plant conservation in the Mediterranean Alps: an example of a cross-border approach

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Conservation challenges are particularly important within regional hotspots of biodiversity. This is the case of the south-western Alps (France – Italy) situated at the interface of the Alpine and Mediterranean ecoregions. This biogeographical border territory has a great diversity of plant species, including numerous endemic species. A key objective here is to perform practical and biogeographical analyses in order to create a hierarchy of species in terms of their conservation importance, and thus the identification of small but key areas to prevent biodiversity loss. First, the ranking of 914 species (i.e. 25 % of the flora) was made with two criteria related to different types of rarity, and a third criteria based on their vulnerability using a standardized and easily repeatable method to define and prioritize conservation actions to undertake. Second, we analyzed the spatial patterns of species richness for endemic, threatened, and high conservation priority species. More than 500,000 occurrences were used in the dataset. Two indices of species richness were computed to identify "local hotspots" of plant diversity. Third, we investigated whether current protected areas include a sufficient proportion of these indicators of species fichness, by using a fine scale analysis (grid of 15 km²), and three types of protected areas, classified according to the efficiency of the protection they provide. The gap analysis of these networks identifies the territories where key patrimonial species are not covered by protected areas. This combined approach, across species and space, allows us to propose priorities for conservation action within the regional biogeographical context. This includes the definition of priority actions for species with the strongest conservation value and the identification of unprotected areas with remarkably high conservation values, located mostly on the periphery of currently protected areas. The weak spatial congruence between local hotspots of endemic and threatened species highlights the necessity of implementing multiple strategies if we are to improve the definition of the regional network of protected areas.

Enjeux de conservation de la flore aquatique et méconnue sur des sites industriels: les genres *Riella* (*Riellaceae*), *Tolypella* (*Charophyceae*) et *Althenia* (*Potamogetonaceae*)

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Les zones humides côtières sont particulièrement exposées à la dégradation ou destruction sous la pression du développement économique. La flore aquatique des marais temporaires saumâtres a été peu étudiée. Des inventaires récents ont mis en évidence la présence d'espèces très rares telles que, *Althenia filiformis*, *Riella helicophylla* and *Tolypella salina* sur un site du sud de la France menace par un projet de développement industriel. Du fait de leur rareté, l'écologie et la distribution de ces espèces sont peu connues. Les objectifs de cette étude étaient d'identifier (1) la distribution et l'abondance de *Althenia filiformis*, *Riella helicophylla* et *Tolypella salina* sur le marais du Caban, (2) leurs principaux traits d'histoire de vie et (3) leurs exigences écologiques. L'abondance des espèces et les conditions environnementales sont été suivies pendant deux ans. La densité des stocks semenciers dans les sédiments (graines et spores) a été évaluée selon une grille systématique. Des expérimentations sur les communautés ont permis de tester les effets de la salinité et de la saison sur le développement et la reproduction des trois espèces.

Alors que *Althenia filiformis* présente une large distribution et une grande abondance, *Tolypella salina*, *T. hispanica* et *Riella helicophylla* étaient plus limitées aux bordures du marais. Les expérimentations en bacs ont mis en évidence un développement opportuniste chez *Althenia filiformis* et *Riella helicophylla* à la fois en hiver et en été. Au contraire, *Tolypella salina* et *T. hispanica* se sont développées seulement après une inondation hivernale. Toutes les espèces ont apparues tolérantes à des salinités fortes mais la diminution de la salinité favorisait leur installation. *Riella helicophylla* et dans une moindre mesure *Tolypella* sp. pl. ont besoins de fortes intensités lumineuses et la transparence de l'eau joue un rôle important dans leur développement.

La diversité des actions de conservation pour la flore de Corse

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Dans le cadre de la mise en œuvre des politiques de conservation de la flore en Corse, de nombreux plans d'actions ont été réalisés au cours des trente dernières années. Les degrés de rareté ou de menace imminente induisent encore régulièrement à eux seuls les actions prioritaires de conservation engagées et leur ampleur. Toutefois, la hiérarchisation des actions de conservation *in situ* doit tenir compte d'autres facteurs environnementaux mais aussi administratifs et sociaux qui peuvent être déterminants pour la réussite des opérations : la maîtrise du foncier, la surveillance et la gestion régulières des sites afin de garantir le bon état de conservation des habitats ; la connaissance des usages et des acteurs locaux. Dans bien des situations, il est également nécessaire d'affiner les connaissances sur l'écologie des espèces afin de détailler les éléments importants pour la réalisation de leur histoire de vie. Lorsqu'aucun de ces facteurs n'est favorable, la pertinence d'une intervention, souvent coûteuse et à l'issue incertaine, peut être discutable. Nous illustrerons, à travers quelques exemples, une diversité de situations liées aux espèces présentant un déficit de connaissances, d'une part, et des espèces rares et menacées, d'autre part. Dans ce contexte, il est important de pouvoir hiérarchiser objectivement et en toute transparence les actions de conservation sur la base d'une règle de décision commune. À ce titre, le Conservatoire botanique national de Corse (CBNC) dispose aujourd'hui d'une Liste rouge régionale de la flore vasculaire de Corse récemment validée par l'UICN et d'une Liste rouge Corse-Sardaigne-Archipel Toscan en fin d'élaboration. Ces Listes rouges, associées à la prise en compte des listes de protection nationale et régionale, de l'écologie des espèces, de la dynamique des habitats et des contraintes foncières et sociales, permettront au CBNC et à ses partenaires de redéfinir et hiérarchiser les actions de conservation des années à venir.

Les translocations réalisées dans le cadre des demandes de dérogation à l'interdiction de destruction de plantes protégées en France : contexte, intérêts et limites

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La règlementation française sur les espèces végétales protégées (art. L 411-1 et 2 du code de l'environnement) impose l'octroi par l'autorité préfectorale, après avis du Conseil national de la protection de la nature, d'une dérogation à l'interdiction de destruction pour toute opération ayant un impact sur des individus sauvages d'une espèce végétale protégée. De nombreuses actions de translocation de plantes sont ainsi proposées et réalisées, dans le cadre de la démarche « Eviter-Réduire-Compenser », à des fins de conservation ou de restauration du bon état de conservation de ces espèces, lorsqu'elles sont impactées par des projets d'aménagement du milieu naturel (infrastructures de transport, ZAC - Zone d'aménagement concerté -, carrières, projets photovoltaïques et éoliens, etc). Un bilan analytique de toutes les propositions examinées au cours des 6 dernières années (de 2010 à 2015) par l'expert délégué flore du Conseil national de la protection de la nature pour toutes les espèces végétales protégées (au niveau national ou régional) en France est présenté. Ce bilan débouche sur des réflexions relatives à la pertinence de telles opérations de translocation et sur des recommandations pour en améliorer l'intérêt et l'efficacité.

Opération pilote de renforcement des populations d'*Astragalus tragacantha* (*Fabaceae*) dans le Parc National des Calanques (Sud de la France)

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L'Astragale de Marseille (*Astragalus tragacantha*, *Fabaceae*) est un buisson épineux endémique des littoraux portugais, espagnols et français. 96% des populations françaises se trouve sur le littoral péri-marseillais du Parc National des Calanques, où elle est protégée au niveau national (classée vulnérable par l'IUCN en 2012). L'Astragale y est établie de manière éparse sur 10 km de trait de côte, le long d'une étroite bande de 100 m de largeur. La fragmentation de ces populations est liée à une intense compétition inter-spécifique, et à diverses pressions anthropiques (urbanisation, piétinement et pollutions organiques). Elle se traduit par une dynamique démographique régressive (régénération quasi-nulle, nécroses foliaires et forte mortalité), soulignant la vulnérabilité de ces habitats. La conservation de l'Astragale constitue ainsi une action prioritaire. Une opération pilote d'ingénierie écologique a ainsi été entreprise afin de renforcer *in natura* trois populations particulièrement menacées, en exploitant le développement d'une double symbiose racinaire de l'Astragale avec des champignons endomycorhiziens et endophytes septés mélanisés et des bactéries nodulantes natives. Cette étude vise à identifier les consortiums de symbiote de l'Astragale pour favoriser la sélection de souches pour optimiser la culture *ex situ*, et le développement des plantules *in situ*, après transplantation. Les graines scarifiées ont été semées en conditions contrôlées, dans divers substrats de culture à base de terreau mélangé ou non avec les sols provenant des trois populations. Cette approche a permis de mettre en évidence les effets notables de l'origine des graines et des substrats sur les taux de croissance et de nodulation *ex situ*, ainsi que sur la survie et la croissance des plantules *in situ*. Les conditions stationnelles réunies dans les deux populations du 'Cap Croisette' et des 'Goudes' permettent d'atteindre un taux de survie moyen des plantules de 63% et 40% respectivement et sont favorables à la croissance de l'Astragale. L'étude de la diversité des bactéries nodulantes chez *A. tragacantha* a permis d'identifier *Mezorhizobium* comme symbiote prépondérant. Cette opération ouvre à de solides perspectives pour intégrer la fonctionnalité des symbioses dans la restauration des populations de l'Astragale à plus grande échelle au sein du Parc National des Calanques.

Ecological originality and genetic isolation: the conservation significance of peripherally isolated population in Mediterrasnean France

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The geological and climatic histories of the Mediterranean have left a series of major traits in the patterns of contemporary species distribution and in particular the fascinating patterns of disjunct distributions of peripheral isolates in many species. This pattern is particularly apparent in Mediterranean France where a large number of listed (and locally rare) species occur at their northern distribution limits. Such isolated populations may harbor a unique evolutionary potential. However, faced with an ever increasing human footprint many of these peripheral isolates are in rapid decline. Peripheral populations (Mediterranean France) occur in sites with a climatic niche with a less pronounced Mediterranean summer-drought but a similar broad vegetation type compared to populations in the central part of their distribution (Spain/Italy). A comparative field-based study of the mico-ecological niche (where plants grow) of 11 species in central and peripheral populations illustrated the ecological originality of peripheral populations. Thermophilous garrigues in France where the species occur are however among the most endangered Mediterranean habitats, and our study provides a basis for a site selection procedure for conservation and reintroduction policy.

An integrative taxonomic approach in the genus *Erysimum* (*Brassicaceae*)

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Delimiting species is essential for elucidating evolutionary process, nevertheless how to perform this goal is still debated (Hausdorf 2011). The recently-arisen approach named "integrative taxonomy" is aimed to study taxa boundaries from multidisciplinary and complementary perspectives (Yeates & al. 2011). According to this approach, the delimitation of a new *taxon* should not rely only on one line of evidence, traditionally the morphology. This does not mean that morphospecies are never valid species, but rather that they are considerable as hypothesis that should be tested with different approaches, searching for a biological or evolutionary explanation for eventual disagreements between different lines of evidence (Yeates & al. 2011). *Erysimum* L. (*Brassicaceae*) genus has roughly 200 species mainly distributed in the northern hemisphere (Polatschek 1986), and it has an important diversification centre in the western Mediterranean region (Greuter & al. 1986). In this genus species delimitation is difficult as a consequence of the morphological similarities among species, probably reflecting rapid speciation processes within the genus (Moazzeni & al. 2014). These rapid speciation events generate species that, although being almost identical morphologically, may be ecologically, genetically and/or geographically isolated from each other. Therefore, the recognized number of *Erysimum* species varies between 150 to 350 species, depending on the author (Moazzeni & al. 2014). Currently 24 species of *Erysimum*, eight of which recently described, occur in Italy. We used morphological, ecological and molecular evidences to verify species delimitation in Italian *Erysimum* species. In particular, we used an iterative approach to test if *taxa* delimited on the base of morphological evidences are corroborated by evidences from cpDNA sequences and by ecological niche models.

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Traditional cytotaxonomic studies: can they still provide a solid basis in plant systematics?

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Since the discovery of chromosomes in late Nineteenth Century, several times researchers posed the question whether, earlier just chromosome number, later basic karyotype structure, might provide information about the systematic position of a species. As a result, vast amounts of karyological data have been collected until now, with a peak of activity in the mid-Twentieth Century.

A karyotype obtained with "traditional" methods (e.g., Feulgen) clarifies the phenotypic aspects of the chromosome complement of a species in terms of number, size, arm ratio, centromere position, and other basic landmark features of its chromosomes. Karyo-morphological traits are evaluated by many authors as important taxonomic characters, which do not only provide additional characters but also allow conclusions about evolutionary events in the group of interest. The karyotype asymmetry is a good expression of the general morphology of plant chromosomes. It is therefore very important to have a uniform system to compare karyotypes on correct statistical grounds. The position of centromere and the relative chromosome size are the two most important karyotype features, which allowed reasonable assessment of chromosomal affinities based on the concept of symmetry. Hence, the use of statistically correct parameters as characters for the reconstruction of karyological relationships is fundamental. However, until now two main problems were, more or less consciously, encountered by researchers: a) a lack of agreement in which karyotype asymmetry parameters have to be used, often leading to their misuse (e.g., redundancy, etc.); b) the use of taxon-specific parameters, not of general applicability (for instance the comparison of each chromosome pair in a karyotype, which can be carried out only among closely related taxa with equal chromosome number). In addition, a number of basic karyological parameters (besides karyotype asymmetry) are of general applicability and can be compared among taxa: chromosome number, basic chromosome number (x), and total length of chromosomes (which is a rough proxy of genome size). Some authors also tried to reconstruct phylogenetic relationships using only the highest possible number of (often redundant) karyological parameters. However, as for other cytotaxonomic features, once karyological relationships between taxa are evidenced, it is also of fundamental importance to have some independent source of information (i.e., a phylogeny) in order to infer the direction and importance of changes. Hence, several caveats must be kept in mind by researchers in this field, both of methodological and interpretative nature.

Limits and potentiality of geometric morphometrics in plant systematics

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Geometric morphometrics methods started to be developed in the late 1980s. During the 1990s, it showed a remarkable qualitative and quantitative development, thanks to the increased understanding of the theoretical basis that underlie the methodologies, the development of protocols of analysis, and the consequent increase in published works that referred to these methods, especially in Zoology and Anthropology. During this time progress in botanical applications has been marginal indicating a reluctance to accept new methods for morphometric analysis. While we cannot exclude a certain cultural inertia by botanists, it is undoubtedly true that the study material of botanists (i.e. plants) is usually less suitable for the application of geometric morphometric techniques. However, in recent years, experiments carried out by botanists gave a glimpse of how these techniques can offer considerable support to systematic studies in botany. This presentation will first analyze the main difficulties related to the use of geometric morphometric techniques with plants, with particular reference to the method of landmarks, limits we need to be aware of for a correct application of these methodologies, and interpretation of results. The presentation will then move on to the observation of situations where geometric morphometric techniques showed significant potential for exploration and/or interpretation in plant systematics.

Environmentally induced phenotypic variation and recurrent ecological speciation in the *Heliosperma pusillum* group (*Caryophyllaceae*)

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Variation in biotic and abiotic conditions in heterogeneous environments can lead to the formation of distinct populations adapted to their specific habitat. *Heliosperma pusillum* and *H. veselskyi* in the Alps are an example of morphological and functional adaptation to creeks and moist calcareous screes in the (sub)alpine belt and rock overhangs and shallow caves in the montane belt, respectively. We have used a broad set of anatomical, ecological, morphological, physiological and genomic (RADseq data) analyses both in natural populations as well as in a common garden to disentangle the evolutionary patterns in this species pair. Although phenotypic divergence remains stable in two consecutive generations in a common garden, both taxa are not divergent in their DNA sequence (RADseq data) and are able to interbreed as revealed by crossing experiments. Moreover, the genetic similarity is correlated with geography rather than taxonomy, suggesting recent and recurrent divergence of both taxa, resulting from middle- to short-term adaptive processes under the influence of the environment. Our analyses support a scenario of multiple independent instances of divergence between the two species during the last 10,000 years. Microclimatic differentiation of natural habitats and adaptation to divergent niches between the species resulted in parallel evolution of differential morphology and functional/physiological traits. We also present preliminary results based on bisulfite RADseq to test for genome-wide differences in DNA methylation correlated with the striking phenotypic differentiation and discuss the possible role of epigenetics in the initial phase of divergent evolution.

Using the multispecies coalescent model to infer species tree/networks and species delimitations

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Genetic data have often been used to delimit species taking monophyly as an exclusive criterion to assign individuals to species. The advent of large multi-locus datasets with their independently evolving loci has demonstrated how important and widespread are discordances across genes. Among others, incomplete lineage sorting and reticulation (e.g., hybridization and/or homoploid and allo-polyploid hybrid speciation) are tremendously important processes producing species polyphyly or paraphyly in gene trees, especially when reconstructing phylogenies at species-rank. Phylogenetic studies in the past were often conducted under the assumption of the absence of ancestral polymorphism or considering dichotomous trees as the only possibility of describing relationship among species. Nowadays, methods are available taking into account allele sorting stochasticity by the analysis of multi-locus datasets in a coalescence framework, or inferring networks by considering incongruences among gene genealogies as the product of hybridization processes. Since assigning individuals to species is the prerequisite of species tree/network reconstruction, methods for simultaneously inferring species delimitation and species trees/networks are eagerly demanded. The present contribution aims at an overview of methods currently used in estimating species trees and species delimitation from multi-locus sequence data. It will review some recent applications in hybridising and polyploid complexes.

The changing role of botanic gardens in the Mediterranean

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In the last 700 years botanic gardens have had a major influence not only on the science and economy but also on culture, economy, architecture, and sociology of the Mediterranean region. In fact their collections and structures represent a significant and rich heritage.

The first academic university botanic gardens were established in the first half of the 16th century in the Italian cities of Pisa (1544), Padua (1545), Firenze (1545) and Bologna (1547) that still today host the oldest botanical gardens in the western world. This development spread through much of Europe with the foundation of the botanic gardens of Zurich, Leiden, Paris, Leipzig, Montpellier, Valencia, etc.

Born as medicinal plant gardens (Gardens of Simples, Giardini dei semplici), for the cultivation and study of medicinal plants and the use their active principles, very soon, botanical gardens adapted themselves to the emerging needs of an era of great exploration, trade and political changes by expanding their activities towards the introduction, cultivation and acclimatization of exotic species and becoming centres of interest to the ruling political classes. Botanical gardens have, in fact, introduced and popularized many plants that are now part of our everyday life as sources of food, fibres, herbs and spices and the ornamentals that largely characterize the anthropic landscapes.

In recent years, in response to growing environmental and social problem, the function of Mediterranean botanical gardens has evolved towards meeting new goals. So, besides horticulture, plant introduction and taxonomy, an increasing effort has been directed towards the *in situ* and *ex situ* conservation of the Mediterranean flora. This involves developing species recovery and reintroduction programmes and environmental education. More recently, botanical gardens are having to respond to the challenges of global, particularly climatic, change and biological invasions.

The activities undertaken inside botanical gardens have increasingly benefited from the application of new technologies and new ways of communication both experimental and digital-interactive, very much in tune with the interests and habits of the younger generations. So, despite ever decreasing financial resources, botanical gardens succeed also in generate an awareness of national and local identities and cultures, in which plants, their cultivation and uses constitute an important element. These new roles require an adjustment by the historic botanical gardens and their scientific, horticultural and technical staff, while the most recently established gardens are already created with a modern vision of their new roles – mainly education and conservation of plant biodiversity. All this calls for greater investments by national and local authorities, not only to finance new botanical gardens or for staff salaries of the existing ones, but to meet these new roles and commitments. Financial resources are required for maintenance of the living collections and the conservation projects that need continue care and cannot rely on short-term project finance, as happens for other research structures.

Networks of botanical gardens and associated institutions are important for the exchange of experience and common programmes, thereby reducing duplication of effort and allowing the achievement of results unattainable by single institutions. It is incumbent on those institutions with greater knowledge and experience to collaborate with younger institutions and those with fewer resources to foster the transfer of knowledge, methods and technical skills.

Challenges faced by urban botanic gardens in the Mediterranean

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Due to the origin of botanic gardens as institutions, dating at least to the 16th Century, the mere existence of c. 2000 worldwide nowadays can be considered a success. And in fact, for not totally obvious reasons, local policy makers in the Mediterranean still find it attractive to invest in creating new botanic gardens, although not so much in maintaining their financial support in the long term. Therefore, urban botanic gardens are not outdated institutions in this region. Their survival over time required, during the second half of the 20th Century, their enrolment in regional and international associations and a rethinking their roles in society. This process led to establishing general topics which botanic gardens should focus on and claim responsibility for, the most important of which is conservation. However, beyond a few basic common elements for every botanic garden – with some further specifics for the Mediterranean – there is a considerable diversity of features that determine their real functions and interaction with the public, which is the key point for their existence. How these particular characteristics interact with the general problems facing every botanic garden, such as urban threats, pollution, lack of space to grow or financial support, is what constitute the challenges of botanic gardens in the Mediterranean. But such diversity also offers opportunities and in the end not all the challenges are negative. Finding the specific niche for each botanic garden, within the wide set of niches encompassed by these institutions, in close interaction with the needs and demands of the public, is what can make them appreciated and sustainable.

Development of new ornamentals, conservation and research in the Jerusalem Botanical Gardens

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The rich flora of the Middle East and Israel is an important source of cultivated species. Some of the most important cut and gardens flowers were cultivated in this region: *Cyclamen persicum*, *Narcissus tazetta*, *Hyacinthus orientalis* and *Anemone coronaria* are obvious examples. In addition, new cultivars were developed in the last decades. Important ones are *Iris* Section *Oncocyclus* hybrids, *Allium basalticum*, *Gladiolus* hybrids and more.

An overview of flower bulb cultivation shows that the most successful are species originating in Mediterranean climates, the rest are sporadic or niche crops.

Cultivation of the local flora is carried also in regards to the gardening trade. Beyond the obvious trees and shrubs (*Quercus, Pistacia, Myrtus, Spartium,* etc), a lot of work was carried out with herbaceous plants, especially with annuals. Half of the local flora is annual and it is a treasure trove for horticulturists. *Lupinus pilosus, Papaver umbonatum, Silene palaestina* are examples for species that are sold as seeds or plantlets to create 'wild' meadows. In well-chosen combinations one can create a long blooming carpet of flowers; but management is needed if it is to survive for several years. Herbaceous perennials and bulbs are more reliable in flowering and will persist for many years. Examples are *Salvia hierosolymitana, Salvia indica, Scilla hyacinthoides*, and *Drimia maritima*.

In the Jerusalem Botanical Gardens we cultivate over 6200 taxa and collaborate with horticulturists, flower growers, nature conservation institutes and university research units. The gardens are an open museum where one can see, learn and even undertake research on many plant species. The importance of local botanical gardens, such as ours, is growing in the face of the reality of population growth and habitat loss that is typical for the whole Mediterranean basin.

Le rôle continu des jardins botaniques méditerranéens dans l'introduction de plantes

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L'introduction de plantes dans les jardins botaniques méditerranéens français commence à Montpellier (1593). La culture de « simples » s'étend ensuite aux espèces exotiques et se développe. Sur le littoral de l'extrême sud-est du pays, l'introduction a pris une ampleur sans précédent dans la deuxième moitié du XIXème siècle, avec l'arrivée d'importants botanistes et de riches collectionneurs. La diffusion des végétaux a fortement influencé le paysage de la Riviera franco-italienne. Le processus se perpétue aujourd'hui, malgré les changements scientifiques, techniques, sociétaux et réglementaires. Comment les orientations et les modalités d'introduction ont-elles évolué ? Le cas de la Villa Thuret (Antibes, France) est analysé et illustré de quelques faits marquant choisis entre sa création en 1857 et aujourd'hui.

Publications et archives révèlent des périodes distinctes, en relation avec le contexte institutionnel et les motivations des directeurs. Gustave Thuret créé son laboratoire sur fonds privés. Les plantes arrivent massivement et constituent des collections génériques. En 1875 on dénombre déjà 4290 accessions pour 2599 taxons vivants sur une superficie de 5 ha. Le jardin sert de support à des études, notamment sur la transmission des caractères (hybridation des cistes). A partir de 1878, le site devient public. Naudin développe les relations avec Melbourne, publie son « Manuel de l'acclimateur » et les premières notes en français sur le genre *Eucalyptus*. Il cherche activement des plantes capables de rendre des services, mais pressent le risque d'invasion biologique. Au début du XXème siècle, le jardin subit un gel destructeur. Les réseaux européens sont sollicités pour reconstituer les collections. Plus tard, avec l'urbanisation du littoral, les plantes devront apporter des solutions environnementales : végétalisation, aménagement des villes, reconstitution de la forêt après incendie. Certains arbres sortent du jardin pour créer des arboretums écologiques ou border les rues. Les changements d'usage préfigurent les changements climatiques.

Aujourd'hui, le jardin Thuret demeure un jardin d'introduction. Les motivations continuent d'osciller entre science, services et pédagogie. Les plantes introduites constituent des ressources domesticables. Le challenge est d'inscrire cette activité d'introduction dans un processus élargi d'acclimatation et de sélection, notamment pour répondre à une demande de production forestière. Le personnel fait évoluer ses pratiques pour améliorer le choix des espèces, en amont et en aval de l'introduction, pour caractériser certains traits (phénologie, adaptation à la sécheresse), limiter les risques d'invasion biologique et se conformer à la réglementation.

Les conservatoires botaniques nationaux en France: nouveaux modèles pour la Mediterranée

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En France, les Conservatoires botaniques nationaux sont, depuis 1990, des organismes agréés par le Ministère de l'Environnement et reconnus par la loi. A travers le code de l'environnement, cet agrément leur confie des missions de connaissance, de conservation, d'expertises et d'information sur la flore sauvage de leurs territoires d'intervention respectifs, définis sur une logique biogéographique : Méditerranée, Alpes, Massif Central, Bretagne, etc.

L'histoire de la création de ce réseau, sans équivalent en Europe, sera tout d'abord développée. Depuis l'émergence des premiers objectifs de conservation et les actions mises en œuvre par les Conservatoires précurseurs dans les années 1970 (Conservatoires botaniques de Brest, Nancy, Porquerolles), les missions et la reconnaissance institutionnelle des Conservatoires botaniques ont beaucoup évolué, jusqu'à la concrétisation actuelle d'un réseau de 11 structures, reconnues par l'Etat, couvrant la France métropolitaine et les territoires d'outre-mer. Une Fédération assure la coordination des missions et la représentation du réseau auprès des pouvoirs publics.

Les grandes missions des Conservatoires botaniques nationaux (connaissance, conservation, expertise, information sur la flore vasculaire, les bryophytes et les milieux naturels) sont aujourd'hui intimement liées aux besoins techniques et scientifiques de la mise en œuvre des politiques environnementales publiques. Le rôle d'expert des Conservatoires botaniques auprès des pouvoirs publics et des acteurs du territoire sera illustré par des exemples concrets.

Les ressources humaines et les moyens techniques (systèmes d'information) mis en œuvre seront enfin abordés en insistant sur les collaborations avec un réseau de structures et d'individus partenaires. Les efforts menés par les Conservatoires pour la diffusion et l'accès aux données d'inventaires ont, dans ce cadre, joué un rôle majeur pour améliorer la prise en compte des enjeux de conservation dans l'aménagement du territoire, mais aussi pour renforcer leur visibilité.

The small Mediterranean islands Initiative (PIM Initiative) and some insights on plant biodiversity and conservation assessment of the small islands of Eastern Tunisia

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With about 10,000 islands and islets whom c. 250 are inhabited by human, the Mediterranean sea encompass one of the largest archipelagos in the world. These numerous islands represent a significant component of the Mediterranean biodiversity, notably with the presence of range-restricted species and peculiar vegetation types. These highly diversified insular biotas and their unicity are the result of the different geographical features inducing diverse biogeographical influences and bioclimatological characteristics, the varied consequences of paleogeographical events, and the current wide ranges of size.

But if the major vegetation structures of the large Mediterranean islands are relatively well known, the biodiversity and conservation value of the small islands (ie. surface < 1,000 ha) are less well known. It is one of the reason why the Mediterranean small islands Initiative (PIM Initiative) was launched by the French Coastal Protection Agency (Conservatoire du Littoral) in 2005. The main objectives of the PIM Initiative are the knowledge of natural and cultural insular heritages, the protection of these microcosms by setting-up practical measures for conservation management, and by facillitating the exchange of information and experience between the site managers and experts from across the Mediterranean Basin.

As a case study, we present the results of several field works performed on some poorly investigated small islands of the Eastern Tunisia, notably the Kerkennah, Kneiss and Djerba archipelagos. Present-day sea-level rise and human impacts induce strong threats to the plant biodiversity of these small and low altitude sedimentary islands. Indeed, since 2000 years ago, the topographic contour of these islands was shaken up and the trend towards land salinization induces a significant advance of halophilous plant communities and species, and a probable extinction - or severe population collapse - of keystone woody taxa characteristic of steppic and maritime habitats (*Juniperus turbinata, Periploca angustifolia, Rhus tripartita*, etc.), not forgetting the famous Lotos (*Ziziphus lotus*) of the Lotophagous island of the Odyssey, ie. on Djerba.

Small Mediterranean islets as "modern refugia" of plant diversity from human pressures: the importance of local studies for conservation planning

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Although many studies have addressed island biogeography, the biodiversity of very small islets has often been underrated due to a lack of high-resolution data. Indeed, when plant species inventories were implemented, the interest for conservation of these areas was highlighted in many different contexts. An especial attention in this sense may be addressed to the Mediterranean Basin, one of the main global biodiversity hotspots characterised by approximately 15,000 islands and islets.

This research was focused on the satellite islets scattered around the coast of Sardinia (Western Mediterranean Basin). According to the updated inventory compiled for the Mediterranean small islands Inititative (Initiative PIM), 239 vegetated Sardinian islets were identified and the respective vascular plant species richness was assessed. We found that, among them, 81 satellite islets host to a minimum of one endemic plant.

Here we discuss the relative importance of such highly diversified insular conditions resulting from different geographical patterns and a wide ranges of surface-area, elevation and levels of human disturbance in determining the endemic plant species richness.

According to other researches, the surface-area and elevation were the main drivers of plant species richness, but considering their low extension and economic interests, the group of smallest islets could be considered as "modern refugia" from human pressures and could thus represent an interesting opportunity of a cost-effective conservation planning for plant diversity.

Insights on the species-richness and on the biogeographic and conservation interests of the vascular flora of circum-Sicilian islands

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Although circum-Sicilian islands and islets cover a surface area of ca. 1% of the whole regional territory, they host ca. 45% of the regional vascular flora.

The update and homogenization of all available botanical data (vascular flora, vegetation, habitats) concerning the circum-Sicilian islands is currently going on in the framework of the Project 'Petites Iles de la Méditerranée' (www.initiative-pim.org). Information on other topics such as geology, geography, human history, disturbance regime is being collected in order to identify the key factors affecting native and alien plant diversity, endemism rate values and local turnover processes.

12 island group 'clusters' have been identified. 130 out of more than 280 investigated islands and islets host vascular plants, and 85 of them have already been studied at least once. As concerns the quality of knowledge, sharp differences still exist between the better known ones (Pelagie and Egadi Islands) and many where last complete botanical surveys date back to 30 years ago or even more (Pantelleria, Stagnone and Aeolian Islands). With the exception of some islets of south-eastern Sicily, most of the data concerning the very small islets (from some hectares to few square metres) are very reliable as they are based on recent field surveys. The values of species-richness of the largest islands are strongly influenced by their size and altitude, but also by landscape patchiness and habitat diversity. Some of these habitats are very rare and threatened with anthropogenic disturbance due to increasing urbanisation and the disappearance of traditional agro-pastoral activities. The most menaced habitats are those linked to sand dunes, lagoons and temporary ponds, but also manmade habitats such as cultivated terraces are under threat.

Due to repeated past connections (Lampedusa) or to stochastic dispersal mechanisms (Linosa and Pantelleria), the islands of the Strait of Sicily host many North-African plants. The high number of endemic and exclusive species of Marettimo supports the hypothesis of its continuous isolation from Sicily. Recent, intense and still ongoing volcanic activity on Aeolian Archipelago has played an important role in shaping local species assemblages, but only past connections with 'older' Italian and Sicilian mainland can explain the presence of several isolated endemics. As concerns endemism, 47 out of the ca. 300 endemic Sicilian plant taxa grow only on its satellite islands, and 34 of them occur on one single island. Even tiny islets may host endemic or exclusive plants, as in the case of Lampione and Strombolicchio.

Contribution de l'Initiative PIM à la connaissance de la biodiversité végétale des petites îles d'Algérie

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L'initiative PIM a démarré en Algérie en 2006 avec une expédition au long court intégrant, avec le bateau Fleur de Lampaul de la Fondation pour la Nature et pour l'Homme, l'exploration des îles Habibas et Rechgoun (Oranie). La mise en place du Commissariat National du Littoral fut aussi une action partenariale forte entre la France et l'Algérie. Diverses expéditions exploratoires, de conseil et de formation aux gestionnaires furent co-organisées avec le CNL (Habibas et Plane en 2007, Serigina en 2008). L'initiative a eu pour effet de stimuler les scientifiques et amateurs algériens qui ont pu se lancer dans des explorations spontanées en Kabylie (îlots de Jijel, îlots de Bejaia) et dans les Dahra (Cap Ténès). D'autres explorations universitaires algériennes concernant l'avifaune maritime et littorale (Numidie) ont eu pour effet d'initier des contacts avec les botanistes locaux. Enfin, l'exploration marine des îlots du littoral oranais par l'association Barbarousse, et soutenue par l'initiative PIM, a récemment été l'occasion de nouvelles explorations terrestres (Cap Falcon).

La synthèse de ces explorations, dont les résultats sont pour partie publiés dans des journaux scientifiques et pour partie inédits, révèle, en dépit du faible nombre d'îles et d'îlots présents en Algérie, une richesse taxonomique cumulée de plusieurs centaines espèces, dont : une dizaine d'endémiques régionales, la classification de deux ZIP (zones importantes pour les plantes) / IPA (Important Plant Areas), la découverte d'une espèce nouvelle pour l'Algérie, la reconsidération taxonomique de deux variétés méconnues…

Mais les explorations ne sont pas terminées, et sur les îles et îlots déjà inventoriés des suivis sont désormais nécessaires. Des études taxonomiques seraient intéressantes à développer sur diverses formes endémiques et sur les espèces en limite d'aire. La fonction de refuge moderne des petites îles, face aux contraintes (naturelles et anthropiques) du continent, serait également une problématique de recherche importante à développer.

Species-based *versus* habitat-based conservation status assessment of the phytodiversity in the Aegean islands (Greece)

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The Habitats Directive (92/43/EEC) introduced the concept of the Natura 2000 network for protected areas across Europe. All EU Member States are obliged to establish conservation measures to maintain or restore a favourable conservation status and develop monitoring systems for surveillance of the effectiveness of the conservation measures applied. The contribution and the effectiveness of the Natura 2000 network towards biodiversity conservation at the species level has been assessed in different areas and studies. The great majority of habitat types are defined by vegetation types, following the phytosociological classification of European vegetation. A large number of methods for nature conservation and enhancement of biodiversity at species and habitat level at a European scale use vegetation to indicate the structure and functioning of a terrestrial ecosystem because of its ecological complexity, compared to single taxa categories. The question of improving the known approaches in order to optimize and make more objective the assessment of the conservation status of plant communities (and their habitat types), as well as of their concerned landscapes is formulated by the aim of this study. With the aim to assess the conservation value of habitats using the species-based approach and a habitat based multi-criteria approach we implemented a GIS methodology to islands and islets in the Aegean area belonging to Sites of Community Importance within the Natura 2000 ecological network. In order to set conservation priorities in the Aegean islands, we used plant species of Annexes II, IV and V of the Directive 92/43/EEC, other endemic/range-restricted and/or threatened species and data concerning the conservation status of habitat types of Annex I (including area, structure and functions, pressures and threats) together with other criteria such as naturalness, replaceability, threat, floristic-phytocoenotic value and rarity. The species-based conservation status assessment attributes a specific weight to the parameter of endemism and rarity, while the combined approach of evaluating plant species population vs. habitat type's conservation status and the Multi-Criteria Evaluation (MCE) emphasize the criteria of area occupied, structure and functions, diversity, rarity, naturalness, replaceability, pressures and threats on each habitat type in combination with the number of significant taxa. The approaches proposed and tested in this study, for assessing the conservation status of habitat types contribute towards the need for accuracy while measuring the biodiversity and consistency when mapping biodiversity across the Aegean region. The method for mapping and assessing conservation value has obvious advantages such as repeatability and application as a basis for short or long-term monitoring programs.

Lichens as niche for black fungi

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The lichen symbioses is an intimate association of heterotrophic fungi, the mycobionts, with their internal populations of photosynthetic partners, the photobionts. The symbiotic structures generally host other associated fungi as well. Two main groups of these can be distinguished according to their conspicuity on the thalli and their degree of specificity towards the lichen hosts. Commonly known as lichenicolous fungi those are commensals or parasites, which develop diagnostic structures and symptoms on the host lichen. In contrast, endolichenic fungi comprise species of cryptic occurrence in the lichen thalli. Both, lichenicolous and endolichenic fungi include fungi with melanin cell walls, which are closely related to the extremotolerant rock-inhabiting fungi (RIF) in the classes Dothideomycetes and Chaetothyriomycetes. Recent studied have expanded the taxon sampling across Mediterranean and Alpine habitats and have investigated the genetic diversity and the species richness of lichen-inhabiting fungi using molecular phylogenetics, culture-dependent approaches and next generation sequencing. We present the phylogenetic relationships of these lichen inhabitants and their free-living black fungal relatives. Information about their host specificity patterns is not complete for lack of marker resolution, but the present data suggest that many black fungi are not specific for the host species, and rather seem to specialize to microscopic habitats conditions on the host structures. The diversity of the retrieved associated fungi further demonstrates the prime role of lichens as fungal diversity reservoirs.

A phylogenetic insight into the diversification of saxicolous black fruited Caloplacas in Eurasia (*Pyrenodesmia*, *Teloschistaceae*)

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The lichen genus *Pyrenodesmia* in a strict sense comprises a phylogenetically coherent group of species within the wider genus *Caloplaca*, which share the lack of anthraquinones and the presence of dark brown to black acetone insoluble pigments in their thalli or hymenia as diagnostic characters. The taxon is widespread across geographic regions, especially in the Northern Hemisphere, but shows an exceptionally high morphological and genetic diversity in the Mediterranean and Irano-Turanian regions of Eurasia.

Previous molecular surveys, although quite incomplete in specimen coverage and number of loci, identified a broad lack of congruence between phylogenetic reconstructions and morphology-based species concepts. To provide solid hypothesis regarding the diversity of the saxicolous species of the genus *Pyrenodesmia*, we carried out a thorough collection of across the European Mediterranean, generated a multilocus dataset to be analysed under the current paradigm of phylogenetic species delimitation.

The Mediterranean *Cladoniaceae*: problems and advances

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The *Cladoniaceae* growing in the 17 Mediterranean countries comprise 118 taxa of *Cladonia* and one *Pycnothelia* species. The first problem found in the study of *Cladoniaceae* in this Region was the irregularity of the data collection since the intensity of the survey depends on the accessibility of the sites, the activity of the lichenologists and the country size. The second problematic question is the delimitation of the Mediterranean area and the third problem is to establish the species boundaries in many cases.

The genus *Cladonia* is easily worldwide recognized by its dimorphic thallus, but most of the species are morphological polymorphic and therefore the delimitation of species is taxonomically problematic. Also, the lichen secondary chemistry has been used as an important character in *Cladonia* taxonomy with nearly 600 different described substances, but in some cases are useless.

The boundaries among the species in some *Cladonia* groups common in the Mediterranean area have been resolved recently. In the *C. mediterranea* group, *C. mediterranea* was monophyletic while the Macaronesian species, *C. azorica* and *C. macaronesica* are reduced to synonyms with *C. portentosa* (Pino-Bodas & al. 2016). *Cladonia subturgida* and *C. iberica* constitute a single species with great morphological polymorphism and 6 different chemotypes, while *C. corsicana* is a different species (Pino-Bodas & al. 2012a). The common complex of Mediterranean taxa having a big primary thallus, *C. convoluta* and *C. foliacea,* which have intermediate forms are conspecific, while *C. cervicornis*, *C. firma* and *C. pulvinata* are monophyletic groups (Pino-Bodas & al. 2010b). The species delimitation between *C. subulata* and *C. rei* was resolved, both taxa being monophyletic, though the presence of fumarprotocetraric acid is not restricted to *C. subulata* (Pino-Bodas & al. 2010a).

There are some groups partially unresolved, such as *Cladonia cariosa* group, with morphological and chemical variability (Pino-Bodas & al. 2012b), or *Cladonia humilis* group, because the currently accepted morphological and chemical diagnostic characters do not prove useful for delimiting species (Pino-Bodas & al. 2012b, 2013).

The characters used to distinguish *C. furcata* and *C. subrangiformis* are highly homoplasious and the species are polyphyletics. The phylogenetic lineages are morphological and chemically variable (Pino-Bodas & al. 2015). Therefore the taxonomy of this group is unresolved. The *Cladonia pyxidata* group includes many described species growing in Europe: *C. pyxidata*, *C. pocillum*, *C. monomorpha*, *C. magyarica* and *C. libifera*. A phylogenetic study based on ITS rDNA, *rpb2* and *ef1α* is presented and the phenotypical characters are discussed.

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Saxicolous lichen diversity in the Mediterranean Basin: an overview of calcicolous communities from Malta

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The Mediterranean basin holds a great variability on rock substrates as a resut of its geological history. Among those materials, calcareous stones are well represented in most of the area.

The Maltese archipelago represents an interesting site as its geology is mainly composed by cretaceous stones, and with a lower diversity compared with surrounding lands. Its location in the central Mediterranean Sea and orography determines a uniform climate through the islands. The main aim of this work is to study calcicolous lichen communities growing in the two main types of stones in the archipelago.

The study has been based on two sorts of rocks: globigerine and coralline, which are the most common substrates on the archipelago. Sampling sites were located in the main island, Malta. Each community was characterized on the sort of stone, exposure and layout of the stone surface. In each site we examined three samples. The sampling was carried based on a square of 10 × 15 cm, which was photographed. The cover of available species in each picture was calculated using ImageJ.

The lichen diversity of the communities included 33 species. Those species were associated within six different communities, one community was found just on horizontal surfaces, three were growing only in vertical surfaces, and two were present in both horizontal and vertical surfaces. The calcicolous communities show differences in terms of their specific composition, which relate to the main byotype (endolithic, placodioid or crustose) and also to several functional traits related wit ecological requirements of lichen species.

Pierre Quézel (1926-2015), une œuvre scientifique entre Méditerranée et Sahara

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Cette communication dresse un bilan synthétique des activités scientifiques du Professeur Pierre Quézel (1926-2015), imminent écologue et biogéographe qui a œuvré durant près de 70 années pour une meilleure connaissance et conservation du patrimoine végétal des régions méditerranéenne et saharienne. Docteur en Sciences et en Médecine de l'Université de Montpellier, il a été Professeur à l'Université d'Alger jusqu'en 1962 puis à l'Université d'Aix-Marseille, où il avait fondé en 1964 le Laboratoire de botanique et d'écologie méditerranéenne qu'il a dirigé jusqu'en 1990. Il fut également le co-fondateur de l'Institut méditerranéen d'écologie et de paléoécologie (IMEP) créé en 1985, et il a été à l'origine de la revue scientifique *Ecologia Mediterranea.*

Auteur de plus de 400 publications scientifiques dont plusieurs ouvrages, il s'est intéressé avec passion et esprit de synthèse à la flore et à la végétation du bassin méditerranéen et du Sahara, en examinant les multiples thématiques liées à la biogéographie, typologie, dynamique et conservation de la biodiversité. Expert reconnu sur le plan international, il a joué un rôle majeur dans la connaissance des végétations méditerranéennes et sahariennes, et dans la reconnaissance de leurs spécificités, tant sur le plan de leurs structures que de leurs dynamiques successionnelles. De par l'orientation de ses recherches intégrant aussi les aspects paléoécologiques et cytotaxonomiques et la formation de nombreux chercheurs sur toutes les rives de la Méditerranée, Pierre Quézel a créé une riche école de pensée, à la fois scientifique et humaniste. En impulsant une dynamique féconde de travaux écologiques et phytogéographiques, il a contribué avec talent à mieux comprendre et préserver ce remarquable point-chaud de biodiversité, véritable capital biogéographique et évolutif à l'échelle mondiale.

Utilisation des banques de graines pour étudier l'évolution contemporaine

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Dans les années 1990, les Conservatoires Botaniques Nationaux ont constitué des banques de graines (e*x situ*) conservées au froid. L'objectif de ces banques est d'utiliser ces graines dans des programmes de réintroduction ou de renforcement des populations dans le futur. Dans le contexte des changements globaux, le succès de ces réintroductions futures supposent que les populations conservées, *a priori* adaptées aux conditions passées, seront en mesure de faire face à un milieu plus chaud, plus fragmenté et appauvri en pollinisateurs. En écologie évolutive, la théorie du secours évolutif (*evolutionary rescue*) propose au contraire que l'évolution à court terme pourrait permettre de sauver les populations de l'extinction dans le milieu naturel.

Dans cet exposé, je montrerai l'intérêt des collections de graines *ex situ* en recherche fondamentale pour étudier l'évolution face aux changements globaux. Je montrerai à l'aide d'exemples concrets comment celles-ci peuvent nous permettre d'étudier l'évolution rapide des traits face au réchauffement et à l'appauvrissement en pollinisateurs. Je discuterai aussi comment ces résultats permettent de réfléchir à des stratégies de réintroductions efficaces dans les populations naturelles.

Partenariat CBN-ARCAD et conservation *ex-situ*: vers des études sur l'évolution des traits de vie et la phylogéographie de la flore méditerranéenne

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Les conservatoires botaniques nationaux (CBN) ont une longue expérience dans la conservation des espèces rares et menacées de la flore sauvage en banques de semences (BS). La conservation *ex-situ* consiste à récolter des graines pour la conservation à moyen et à long terme en vérifiant régulièrement leur potentiel de germination afin de réintroduire et / ou régénérer les populations menacées. Cette démarche peut être consolidée en s'appuyant sur des études de l'évolution des traits de vie et de la phylogéographie dans un contexte de changements globaux (changement climatique, fragmentation d'habitat liée aux activités anthropiques…). De telles connaissances permettent de mieux gérer les BS à des fins de réintroduction et/ou de régénération des populations menacées. Le partenariat CBN-ARCAD offre le cadre scientifique et technique adéquat pour la conservation *ex-situ* et pour les études liées à la caractérisation des graines et à l'analyse de la diversité génétique. ARCAD (Agropolis Resource Center for Crop Conservation, Adaptation and Diversity) est un centre national de conservation et de ressources génétiques végétales, porté par les organismes de recherche d'Agropolis International à Montpellier (INRA/SupAgro/CIRAD/IRD). Il constitue un centre de partage et de mutualisation des méthodologies et des plateaux techniques : i) conservation *ex-situ* des graines, ii) caractérisation des graines (morphométrie, composition chimique…), iii) cryoconservation des semences non-orthodoxes, iv) banques d'ADN et génotypage et v) systèmes d'information et bases de données. Dans cette communication, nous présentons le partenariat CBN-ARCAD. Nous décrivons, ensuite, la démarche adoptée pour la construction d'une banque de semences CBN-ARCAD et les critères de sélection des groupes de taxons à conserver. Enfin, nous identifions les taxons, en BS du CBNMED, candidats à des études sur l'évolution des traits de vie et la phylogéographie.

Strategie et perspectives en conservation *ex situ* en France méditerranéenne continentale

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Afin de préserver le patrimoine floristique, les Conservatoires botaniques nationaux contribuent à la conservation des espèces menacées et à la sauvegarde de la diversité génétique notamment avec la conservation *ex situ* des espèces (en dehors de leur milieu naturel) qui peut prendre la forme d'une banque de graines ou de collections vivantes. Ne pouvant conserver l'ensemble de la flore sauvage au sein de sa banque de semences, le CBNMed a procédé à une sélection d'espèces à conserver. Pour cela une stratégie de récoltes pour les années à venir a été élaborée. En conservation *ex situ*, l'obtention d'une plantule viable commence par une bonne récolte des graines. La récolte du matériel génétique destiné à la banque de semences constitue une phase très délicate qui doit être planifiée et suivie selon une méthode rigoureuse. Une fois récoltées, ces graines doivent être triées et mises à sécher afin de pouvoir être conditionnées pour une conservation dans la banque de semences. Les techniques de conservation en chambre froide et en lyophilisation ont été choisies après des années de tests garantissant une bonne conservation des graines de plantes méditerranéennes. Ces graines subiront des tests de germination en conditions contrôlées lors de leur introduction en banque de graines et au cours de leur conservation afin de contrôler leur viabilité dans le temps. Une description des semences est réalisée dans le but d'obtenir à terme une base de traits des graines conservées.

La gestion des espèces en conservation *ex situ* engendre un grand nombre de données. Afin de les répertorier, une base de données, accessible en ligne, évolutive et interactive a été initiée par le CBNMed en collaboration avec le Conservatoire botanique national alpin (CBNA) pour référencer et gérer l'ensemble des résultats produits lors des récoltes, du stockage, des tests germination et de viabilité, de la caractérisation des graines, etc.

Cette banque de graines alpes-méditerranée est accessible en ligne sur le site http://banques-de-graines-alpes-mediterranee.eu. Elle se veut transfrontalière puisqu'elle regroupe également la banque de graines du Centre sur la biodiversité végétale (CBV - secteur opérationnel du parc naturel du Marguareis en Italie).

Cette base évolutive permet ainsi la gestion et la diffusion de l'information concernant les banques de semences, mais aussi une meilleure valorisation du travail effectué en conservation *ex situ*.

Evolution spatiale et temporelle de la régénération séminale de plantes patrimoniales des Alpes du Sud

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La capacité qu'ont les espèces végétales à se régénérer (passer successivement à travers les différents stades de vies jusqu'à l'élaboration d'une nouvelle génération) dépend en majorité de l'adéquation à l'environnement qu'elles rencontrent. Les changements environnementaux contemporains, comme le réchauffement climatique, le changement de l'utilisation des terres ou encore la fragmentation des habitats contraignent ces processus de régénération. A l'heure d'une crise de la diversité, il est nécessaire de développer des outils permettant l'évaluation d'une part de l'état de régénération des populations ainsi que de leurs capacités d'adaptation face aux changements environnementaux.

Cette étude, menée par le Conservatoire Botanique National Alpin (CBNA) et le laboratoire d'Ecologie Alpine (LECA), vise à évaluer l'évolution spatiale et temporelle de la régénération séminale de plantes patrimoniales des Alpes du Sud en lien avec les modifications environnementales et particulièrement les changements climatiques en mesurant sur plusieurs générations des traits majeurs comme la germination, la croissance et la reproduction des individus, sur des populations 'ancestrales' conservées en banque de semences au CBNA et des populations 'descendantes' récoltées durant l'étude.

Les travaux menés dans cette étude mettent en évidence un changement des espèces végétales sur des temps relativement courts impliquant des différenciations génétiques.

L'utilisation d'individus de populations ancestrales stockées en banque de semences dans le cadre de mesures de protection tels que la réintroduction et/ou le renforcement de populations, pourrait, dans le cas de différences génétiques trop fortes, impliquer de la mal adaptation et influencer la réussite de telles opérations. Si cela ravive la question de l'intérêt d'une conservation figée dans un environnement constitué de populations en perpétuel changement cela montre aussi la ressource que constituent les banques de semences pour étudier l'évolution contemporaine des espèces végétales.

Innovative perspectives of the Sardinian Germplasm Bank (BG-SAR) for the preservation of Mediterranean plant diversity

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The Sardinian Germplasm Bank (BG-SAR) is part of the *Hortus Botanicus Karalitanus* (HBK) which belongs to the University of Cagliari. The main objectives of BG-SAR are the conservation, study and management of germplasm of Sardinian endemics, threatened and policy species (taxa inserted in the Habitat Directive 92/43/EEC, CITES and Bern Convention). In the last 10 years, although the primary aims and studies were focused on the conservation of these plant species, particular interest was provided also to the Crop Wild Relatives (CWR), landraces and useful plants. Furthermore, starting from some years, also plant remains recovered from archaeological sites were stored at BG-SAR. BG-SAR develops a conservation strategy based on the regional responsibility criterion, which it is reflected in the Target 8 of the Global Strategy for Plant Conservation for 2020 and in the Aichi Biodiversity Target 12 of the United Nation Convention on Biological Diversity.

Before of dehydration, stage prior to the conservation, each seed lot is scanned and digital images acquired in order to allow subsequent studies through the innovative morpho-colorimetric technique. Moreover, studies on the germination ecophysiology are carried out to increase the ecological knowledge, especially for endangered and threatened taxa, and define the optimum germination protocol for each of them. In the last years, particular attention is given to studies on thermal time and niche modelling, as well as on the effect of global warming on seed germination of mountain Mediterranean species. Moreover, comparative studies on the effects of abiotic stresses, such as salinity (e.g. NaCl), or the nutrient availability (e.g. KNO3) are carried out among several Mediterranean species, especially for endangered coastal ones. In the case of invasive alien species (IAS), the identification of their tolerance to salt, helps us to predict their potential invasive power also in salt habitats. Furthermore, the study of the effects of salt spray on seedling growth of threatened species, is useful to better understand their distribution in coastal habitats.

Recently, new researches for the study of archaeological seeds were developed. Particular emphasis is placed on the origin of agriculture and the transformation of plants and landscapes through domestication.

All these innovative approaches allow to BG-SAR, not only to attain an effective ex-situ conservation, but also to face actual and important problems, such as global warming, invasiveness of alien species and behaviour of endangered Mediterranean species.

Conserving plant diversity and improving livelihoods: examples from Latin America, Sub-Saharan Africa and the Mediterranean region

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Seed banks hold priceless genetic diversity which is of value to livelihoods by preserving plants which are important for human well-being and storing knowledge associated with their conservation and use. The Royal Botanic Gardens, Kew, are working with a wide range of collaborators from Latin America, Sub-Saharan Africa and the Mediterranean region to conserve seeds and help local communities find new ways of using natural resources sustainably. This is achieved through (1) the selection of indigenous useful plants; (2) the collection and preservation of these species' seeds; (3) plant propagation and establishment of useful plant gardens; and (4) the promotion of sustainable use and income generation with targeted species. The capacity of local communities is enhanced through training and the improvement of local facilities for seed storage and plant propagation. The success of this cooperation is determined by its participative approach, involving local communities in plant conservation activities and using plant research to support them. However, some challenges have been encountered, which confirm the importance of using a 'holistic approach' in achieving the dual objective of conservation and sustainable development for local communities. They also highlight the need for social and economic skills to assist local communities to establish activities to generate income in or near their villages.

Histoire de la bryologie en France et de la contribution des bryologues Français dans la région méditerranéenne

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Au cours du XIXe siècle, la bryologie en France, se développe autour d'un réseau dense et dynamique d'amateurs. En résulteront la publication de flores régionales ou nationales et de monographies, et la création d'une revue spécialisée, *Revue bryologique* (1874). Les publications de W.P. Schimper (au début XIXe) et d'E.G. Paris (fin du XIXe) marquent chacun à sa façon des tournants dans l'étude des bryophytes. L'institutionnalisation de la discipline, via la chaire de Cryptogamie du Muséum national d'histoire naturelle en 1904, crée un élan jusque dans les années 1980. A l'heure actuelle la bryologie, en France, reste une discipline essentiellement pratiquée par des amateurs. L' influence du Muséum et de certaines facultés sur les études de la bryologie dans le bassin méditerranéen est évaluée au cours du temps : de l'impact colonial (Algérie, Tunisie au XIXe s.) à la décision d'exploration systématique dans les années 1960. De l'affaire de quelques-uns, ces études sont devenues l'affaire de tous les pays autour de la Méditerranée, notamment sous l'impulsion de la section de Bryologie d'OPTIMA.

Sphagnum (*Sphagnaceae*) from Mediterranean basin: high genetic richness in relict peatlands

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Mediterranean basin is regarded as a hot spot of biodiversity, hosting rare and endemic plant species and providing a refuge area during the last ice age. *Sphagnum* peatlands cover a wide surface in Northern Europe, while remnant populations remain in Mediterranean basin, where dry climate and water drainage make bogs and peatlands vulnerable environments. The present study investigates the genetic variation and structure of Southern European populations of *Sphagnum*, based on microsatellite analysis of 62 samples included in the sections *Sphagnum*, *Squarrosa*, and *Subsecunda*.

Microsatellite analyses indicate a clear partition among the three sections, although most of the variance was found within the sections (82%), and especially within *Sphagnum*. Analyses carried out at level of each section show that species circumscription does not always reflect taxonomy based on the morphological traits. Particularly, in *Subsecunda* section *S. auriculatum* and *S. inundatum* merge in a single cluster, a result also observed in conspecific samples from Eastern North America. A partial overlapping occurs within *Sphagnum* section, for *S. palustre* and *S. centrale*, in contrast with the findings achieved in North American conspecific samples. The molecular and morphological analyses of *S. palustre* from a floating islet in Posta Fibreno lake (Southern Italy), collected at different depths, show that this is the only *Sphagnum* species colonizing the floating mass of vegetation, and indicate the Spain as the possible country of origin for that small population. Our results show that these Mediterranean populations harbor a high genetic richness, and suggest microsatellites as suitable markers to identify the proper genotypes for *in situ* recolonization purposes.

Insights into the landscape genetics of some common mosses

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The genetic diversity of organisms is structured not only according to geographical distance but also according to environmental or ecological factors. Many of these environmental factors e.g. altitude, precipitation, etc. can be interpreted as "landscape features" and accordingly genetic diversity can be studied under the light of landscape characteristics of all types. Here we present results obtained with widely distributed and common bryophytes*: Bryum argenteum* and *Didymodon vinealis*. In the first case, our data show that when studying the genetic diversity at an intercontinental scale, with the exception of the Antarctic region, population genetic parameters indicate a low differentiation. This shows that the dispersal capacity of this organism is high, at least at evolutionary time scales. Contrasting with these findings is that at very short distances genetically clearly separated populations are identified in the Spanish Sierra Nevada Mountains and surrounding areas. Based on nuclear ITS sequences, there is one clade restricted to sites above 2000 m a.s.l. Similar sequences are abundant in the Antarctic region. A connection between altitude and genetic diversity was also observed on Tenerife for this species. In this case, the data suggest that the island populations were not introduced by human activities but existed prior to human colonization. The results obtained for *B. argenteum* indicating genetically differentiated populations at short distances are confirmed by a parallel study of *Funaria hygrometrica*.

Not only natural factors like climate are shaping landscape but in many regions of the world human activities are very important. In most countries agriculture is occupying a major part of the available terrestrial surface with a deep impact. It is evident that while a low number of species is favored by agriculture many other species have problems to adapt or disappear completely. Here we present preliminary data that suggest that in the case of the moss *Didymodon vinealis*, which can be found frequently on cultured soil under olive trees, certain genotypes seem to grow preferentially under natural conditions while others seem to be better adapted to the conditions of the cultured soils. At his moment, it is not clear which factors are responsible for the selection of certain genotypes under artificial conditions.

Turkey, an important harbour for Bryophytes in Mediterranean basin

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Over the last few decades, many important additions to the bryophyte flora of Turkey have been carried out. Up to date, more than 800 mosses, nearly 190 liverworts and 4 hornworts have been recorded in Turkey. Turkey is one of the richest areas in middle latitudes in terms of plant diversity. Main reasons for this are: climate variations, geomorphological and soil diversities, and the geographical position of the area at the junction of three floristic regions (Euro-Siberian, Mediterranean and Irano-Turanian). Also Turkey, due to its link with the African continent, is home to many xeropottioid species. Nearly 10% of South-West Asia's total known bryoflora is of xero-tropical origin (Kürschner 2008). There are many hotspots in South Western Anatolia which is a refuge area especially for xeric bryophytes. One of the most remarkable genus is *Cinclidotus* in Turkey. In a study carried out by Erdağ and Kürschner (2011), it was suggested that the speciation centre of *Cinclidotus* species is Turkey. It is clear that new taxa recorded especially from the southern area of the country indicates that Turkey is a diversification center for these taxa. The other worth investigating genus is *Riccia*. It has the highest level of representation of the liverworts with 25 taxa. Recently a revisional study has been carried out by our research group on these species which were mainly recorded from the Mediterranean floristic region.

In this study, Turkish bryophytes, especially from the Mediterranean floristic region, will be evaluated and recent bryological studies in Turkey will be presented. One of the most important developments is the beginning of the written of a Turkish bryophyte flora.

Erdağ, A. & Kürschner, H. 2011: The *Cinclidotus* P. Beauv./*Dialytrichia* (Schimp.) Limpr. complex (Bryopsida, Pottiaceae) in Turkey. – Bot. Serbica **35(1):** 13-29.

Kürschner, H. 2008: Biogeography of South-West Asian Bryophytes – With Special Emphasis on the Tropical Element. – Turkish J. Bot. **32:** 433-446.

Epiphytic bryophytes on islands: elevation patterns across different archipelagos

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Starting from the fundamental research question of what generates and maintains the global spatial heterogeneity of diversity, the MOVECLIM project (Montane Vegetation as Listening Posts for Climate Change) aims to investigate spatial changes in diversity for bryophytes, an understudied taxonomic group, across elevational gradients in oceanic islands (ex. Pico, Terceira, La Palma, Guadaloupe, La Réunion, Madagascar).

The BRYOLAT protocol (adapted), relying on a homogeneous hierarchical sampling strategy, was used to gather information from native vegetation sites in all islands. Firstly, one transect was set per island, ideally facing the same orientation and, at 200 m elevation intervals, two permanent plots (100 m^2) were set. Then, three quadrats (4 m^2) were randomly selected and thoroughly examined within each plot, and three replicates were collected from six substrates (if present): rock, soil, humus, rotten wood, leaves and the bark of the most common woody species present on site (at three tree heights). For the data analysis we selected epiphytic bryophytes since they are a diverse group in tropical and temperate ecosystems and are good indicator and ecologically relevant species, although poorly studied. Regarding epiphytic mosses and liverworts, we explored how species richness (alpha diversity) and both components of beta diversity (species replacement/turnover and richness difference) were affected by elevation gradients in the different islands.

Although the total richness of each island (gamma diversity) varied among the four studied systems, with tropical islands richer than temperate, the number of species peaked at intermediate altitudes in all islands but Terceira, where an "end of the island" plateau occurred. Both components of beta diversity vary along the elevation gradient, with Beta replacement reaching higher values where the vascular vegetation was most homogeneous.

It is thus clear that among epiphytic bryophytes, the elevational gradient is important to the heterogeneity of diversity and that in spite of overall differences in total richness, the alpha diversity patterns appear congruent rather than idiosyncratic across archipelagos.

Patterns of genome evolution in the genus *Cardamine* (*Brassicaceae*)

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Cardamine (bittercress) is one of the largest *Brassicaceae* genera (200 spp.) with number of species occurring also in the Mediterranean area. The genus exhibits a large karyological diversity (2*n* = 16 to c. 256). Due to the feasibility of comparative chromosome painting and genomic *in situ* hybridization in the Brassicaceae, we documented both recurrent and deviating patterns of genome evolution in *Cardamine* polyploids:

(i) Some tetraploid (2*n* = 32) populations of *C. pratensis* are on the way to decrease their chromosome number by "chromosome fusions" (2*n* = 30 and 28). On the contrary, some diploid (2*n* = 16) populations of *C. pratensis* contain hyperdiploid plants with one to four additional chromosomes (2*n* = 17, 18, 19, and 20).

(ii) We elucidated independent origins of several European and Asian tetra- and octoploid (2*n* = 32, 64) species of the *C. flexuosa* complex through hybridization events involving three diploid progenitor species. This includes *C. occulta* recently invading Mediterranean and Central Europe

(iii) In *Cardamine*, hybridization and polyploidization is ongoing. We reconstructed the origin of the triploid hybrid *C.* ×*insueta* (2*n* = 24, RRA) through hybridization between *C. amara* (2*n* = 16, AA) and *C. rivularis* (2*n* = 16, RR) c. 100 years ago. Hybridization involving *C.* ×*insueta* and the hypotetraploid *C. pratensis* (2*n* = 30, PPPP) resulted in the origin of the hypohexaploid *C. schulzii* (2*n* = 46, PPPPRA). This shows how a semifertile triploid hybrid can promote the origin of trigenomic allopolyploids.

Unending hybridization and polyploid speciation stories: lessons from *Spartina* (*Poaceae*)

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The former genus *Spartina* (*Poaceae*, *Chloridoideae*) represents a monophyletic lineage embedded in the large paraphyletic former *Sporobolus* and *Calamovilfa* genera. *Spartina* species are perennial plants colonizing salt marshes. The genus most likely arose from a polyploid ancestor, and has evolved in two extant lineages, one tetraploid (2*n*=4x=40) diversified in the New World, and one hexaploid (2*n*=6x=60-62), containing New World and Old world species. Recurrent hybridization and genome duplication within and between these lineages resulted in the formation of new ploidy levels (heptaploid, nonaploid and dodecaploid). During the two last centuries, human-mediated species introduction outside their native range have accelerated diversification through rapid expansion of introduced plants, interspecific hybridization with natives and allopolyploid speciation. In Europe, such examples include (i) the cryptic introduction of the East-American tetraploid *S. patens* (which has until recently been considered as a Mediterranean endemic under the name of *S. versicolor*), (ii) introduction of the South-American heptaploid *S. densiflora* to the south-west coasts of the Iberian Peninsula and its subsequent hybridization with the native hexaploid *S. maritima* and (iii) introduction of the East-American hexaploid *S. alterniflora* to western Europe (UK, France, Spain) and its hybridization with *S. maritima* in England and in southwest France. In England, hybrid genome duplication resulted in a highly successful allododecaploid species, *S. anglica* that has now colonized European saltmarshes and is introduced in several continents. *Spartina* represents then an excellent model system to explore the consequences of reticulate evolution and genome duplication at various evolutionary time scales. Hybrid and polyploid genome dynamics will be discussed in the light of their ecological implications

Polyploidy and karyotype variation in the bulbous genera (*Hyacinthaceae*) from Southern Turkey

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The family *Hyacinthaceae* (*Asparagaceae*) represented by eight bulbous genera (*Bellevalia, Drimia, Hyacinthella, Hyacinthus, Muscari, Ornithogalum, Prospero, Scilla)* in the Mediterranean area of Turkey. This paper based on the study carried out during the years 2010-2014 on this family distributed in the Kahramanmaraş province, Southern Turkey. The province consists of mountains and plains, with its very rich flora about 2500 vascular plants of which 20% endemics. The genus *Drimia* except all other genera occur in the province with totally 40 taxa. The chromosome numbers and karyotypes have been determined as 26 species as diploid and 13 species as polyloid from 112 populations. They are as follows, (*=endemic): **Bellevalia gracilis* Feinbrun 2*n*=8 diploid, 2*n*=16 tetraploid; *B. macrobotrys* Boiss. 2*n*=8 diploid; **B. tauri* Feinbrun 2*n*=8 diploid; **Hyacinthella acutiloba* K. Persson & Wendelbo 2*n*=18 diploid: **H. lazulina* K.Persson & J.Persson 2*n*=22 diploid; **Hyacinthus orientalis* L. subsp. *chionophilus* Wendelbo 2*n*=16, 2*n*=18 and 2*n*=20 diploid; *H. orientalis* L. subsp. *orientalis* 2*n*=18 diploid; **Muscari anatolicum* Cowley & N.Özhatay 2*n*=27 triploid; *M. armeniacum* Leicthlin ex Baker 2*n*=18 diploid; 2*n*=27 triploid, **M. aucheri* (Boiss.) Baker 2*n*=18 diploid; **M. azureum* Fenz. 2*n*=18 diploid; **M. babachii* Eker & Koyuncu 2n=18 diploid; *M. comosum* (L.) Miller 2*n*=18 diploid; *M. neglectum* Guss. 2*n*=18 diploid, 2*n*=36 tetraploid, 2*n*=45 pentaploid, 2*n*=54 hexaploid; *M. parviflorum* Desf. 2*n*=36 tetraploid; *M. tenuiflorum* Tausch 2*n*=18 diploid; **Ornithogalum alpigenum* Stapf. 2*n*=18 diploid; *O. balansae* Boiss. 2*n*=24 tetraploid; *O. lanceolatum* Labill. 2*n*=18 diploid; **O. luschanii* Stapf. 2*n*=12 diploid; *O. montanum* Cyr. 2*n*=28 tetraploid, 2*n*=36 tetraploid; *O. neurostegium* Boiss. & Blanche 2*n*=18 diploid, 2*n*=21, 2*n*=24 triploid; *O. oligophyllum* E.D.Clarke 2*n*=12 diploid; *O. orthophyllum* Ten. 2*n*=16, 2*n*=18 and 2*n*=20 diploid; *O. pedicellare* Boiss. & Kotschy 2*n*=18 diploid; *O. platyphyllum* Boiss. 2*n*=14, 2*n*=18 diploid; *O. sigmoideum* Freyn & Sint. 2*n*=18 diploid; *O. umbellatum* L. 2*n*= 22 diploid, 2*n*=45 pentaploid; **O. vasakii* Speta 2n=12 diploid; *O. wiedemannii* Boiss. var. *wiedemannii* 2*n*=28 tetraploid; *O. hajastanum* Agap. 2*n*=14 diploid; *O. narbonense* L. 2*n*=18 diploid; **O. sorgerae* Wittmann; 2*n*=18 diploid; **O. kayiranii* S. Demirci & N.Özhatay *sp. nov.* 2*n*=16 diploid; *O. sphaerocarpum* Kerner 2*n*=18 diploid, 2*n*=28 and 2*n*=32 tetraploid; **Prospero andirinense* S.Demirci & N.Özhatay *sp.nov.* 2*n*=16 diploid; *Scilla bifolia* L. 2*n*=18 diploid; 2*n*=36 tetraploid; *S. ingridae* Speta 2*n*=12 diploid and 2*n*=24 tetraploid; *S. melaina* Speta 2*n*=12 diploid. Polyploid species and two new species were found around Andırın village situated in the southeast of the province.

Refugial plant survival: role of polyploidy and hybridization in the evolution of resurrection plants from the genus *Ramonda* (*Gesneriaceae*)

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Three out of five *Gesneriaceae* species in Europe belong to the genus *Ramonda*. These are: *R. nathaliae* and *R. serbica*, two endemic species of the Balkan Peninsula and *R. myconi*, endemic of the Iberian Peninsula. They are Tertiary relicts, remnants from the times when the climate in Europe was much warmer and more humid. During the Ice Age, they have found shelter in canyons and gorges and we still find them in this type of refugial habitats, protected from too much competition from other plant species. Poikilohydric nature of these so-called „resurrection plants" helps them survive the inhospitable environmental conditions and these characteristics keeps them in the scope of physiological research. However, they are equally interesting from evolutionary point of view. *Ramonda myconi* and *R. nathaliae* are diploids (certainly already diploidized paleopolyploids) with $2n = 2x = 48$ chromosomes, but different in monoploid genome size (1Cx = 1.30 pg and 1Cx = 1.16 pg, respectively). *Ramonda serbica* is hexaploid with $2n = 6x = 144$ chromosomes and monoploid genome size similar to that of *R. myconi* (1Cx = 1.32 pg). Scarce octo- and decaploid individuals are also found in one population of *R. serbica* from Montenegro. Additionally, mostly tetraploid hybrid individuals with $2n = 4x = 96$ and intermediate genome size between *R. nathaliae* and *R. serbica* are revealed in two unique sympatric populations both situated in SE Serbia. Thus, extensive cytogenetic and molecular research suggest complex past time relationship among three *Ramonda* species, and shed light on ongoing relation between *R. nathaliae* and *R. serbica* as well, with possibility of back crossing, genome duplication and reciprocal introgression. Polyploidization certainly stands out as a major evolutionary mechanism in the genus *Ramonda*. Nevertheless what are the ecological consequences of different ploidy levels and what could be the evolutionary consequences of hybridization between two *Ramonda* species from the Balkan Peninsula remains to be seen.

Cytogenetic insights into plant diversification: *Asteraceae* as a case study

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Asteraceae constitute an extremely interesting family to study plant diversification, since they have successfully colonised a wide range of ecosystems, including harsh and extreme habitats. In this communication we focus on *Cheirolophus* Cass., a small genus within the Centaureinae, which represents one of the most striking cases of species radiation in Macaronesia, where it diversified into a lineage of ca. 20 endemic species at a rate that is amongst the fastest reported for oceanic islands. Whilst the cytogenetic dynamics of several of the Macaronesian *Cheirolophus* species have been comparatively well studied, an overview of chromosome and genome evolution has been hampered by the lack of data for the earliest-diverging species endemic to Malta, *Ch. crassifolius*. In order to tackle that question, we have recently completed a comprehensive cytogenetic survey of the genus to investigate how different cytogenetic traits may have contributed to the radiation and diversification of the genus. We provide new cytogenetic data (i.e. chromosome counts, genome size estimates and physical mapping of 35S rDNA loci) for several key species, including *Ch. crassifolius*, and then model trait evolution within a phylogenetic context.

Our results have revealed a trend of genome downsizing accompanied by a dramatic increase in number of terminal 35S rDNA loci, which started early in the evolutionary history of the genus, before its radiation in Macaronesia. It is notable that the increasing number of 35S rDNA loci has not been driven by recent whole genome duplications, in contrast to the more typical trend observed in many angiosperms, although paleopolyploid events might have played an underlying role. In addition, the number of 35S rDNA loci has been observed to negatively correlate with genome size, which is also very unusual in angiosperms. Bearing in mind all these facts, it is suggested that illegitimate and unequal homologous recombination are the most likely mechanisms to explain these observations and we discuss whether the unique genomic architectures of *Cheirolophus* could have predisposed the genus to its successful and rapid speciation in Macaronesia.

The nature and composition of urban plant diversity in the Mediterranean

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Mediterranean urban areas house substantial amounts of biodiversity – both plant and animal. Urban green spaces include (a) areas of natural or semi-natural vegetation such as ecosystem fragments, reserves, nature parks, forests, and river banks, which house varying amounts of native species; (b) managed spaces with cultivated vegetation such as parks and gardens; and (c) informal urban green spaces such as wastelands or brown field sites which are largely colonized by weeds, ruderal plants and invasive species. Considerable attention has been paid to the biodiversity values of the first two categories but the last category which includes areas such as such as industrial wastelands, roadside verges, river and canal banks, railway line embankments, has been largely neglected. The benign climate of the Mediterranean region has permitted the cultivation of a wide range of both temperate and semitropical trees, shrubs and herbaceous plants in parks, gardens and other urban settings. The main managed elements are public parks, private and domestic gardens, botanic gardens, zoological parks, glasshouses and shade houses, planted urban forests, street trees, landscaping of office blocks, residential apartment blocks, public buildings, university and college campuses, business parks, golf courses, nurseries, garden centres, and more recently green roofs and living walls. While the diversity of species grown in urban botanic gardens is usually well documented, we have little detailed information on the overall range of species grown in public parks and gardens and, with some exceptions, even less of those grown in private gardens. Street trees are an important component of urban diversity with more than 55% of streets in a city like Madrid populated with trees, totalling altogether 300,000 specimens. Many cities have published guides to their urban street trees but there is no overall compilation. Overall, it is likely that altogether several tens of thousands of plant species are grown in Mediterranean urban areas, representing a very substantial source of biodiversity. The inventory of urban plant diversity is very uneven: for some cities such as Ioannina, Jerusalem, Montpellier, Naples, Patras, Rome, Sousse, fairly comprehensive inventories have been compiled but for most our knowledge is incomplete. Given the large growing percentage of city dwellers in the Mediterranean, it is important that much more attention should be paid to understanding and maintaining urban plant diversity which contributes substantially to human health and wellbeing.

Plant diversity in Mediterranean urban parks and gardens

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Although many public authorities have had to prune their budgets in recent years, there seems to have been a mixed response in Mediterranean urban parks and gardens. Although the quality and maintenance of some municipal parks and gardens have suffered, a good many municipalities have upgraded and rejuvenated their green spaces, and often new parks and gardens have been created; in addition, their websites now provide excellent information, with a great deal more data than history and maps. Directors and superintendents of urban parks and gardens are usually highly trained horticultural professionals with an understanding of landscape design and plantsmanship and are supported by significant mechanised equipment, or they have contracts outsourced to knowledgeable professional companies.

Private urban gardens reflect the dedication and investment of their owners which may decline with age, inheritance or sale. Here, we have a fluid situation with many new gardens being created, often with professional designers involved, and new plant collections being acquired and developed as older ones are run-down or lost. A huge industry in garden design and construction has developed, whilst the increase in garden-visiting, including by societies, such as: Mediterranean Garden Society, Mediterranean Plants and Gardens [UK], Mediterranean Gardening France and Mediterranean Gardening Association Portugal, has resulted in learned individuals able to copy ideas and features for their own city plots.

Anybody prepared to research parks and gardens, and their owners, on the internet and through society and personal contacts, will discover that a huge range of plant diversity exists in the public green spaces of Mediterranean urban areas and in a great variety of situations.

L'impact du vert urbain sur le niveau de la diversité végétale

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Le milieu urbain, notamment quant à l'étude de la flore et de la végétation synanthropiques, a reçu l'attention des botanistes dès les premières décennies du siècle dernier. Les plantes colonisant les arbres et les murailles, et plus généralement les rudérales, ont vu cet intérêt accru aussi au point de vue de stratégies possibles pour le contrôle et la gestion des espèces allergisantes ou causant la dégradation des monuments historiques, architecturaux et archéologiques. À cet égard, la ville de Rome a servi de véritable laboratoire: d'incomptables contributions floristiques, et plus récemment d'écologie urbaine, ont été apportées par la communauté scientifique locale. Les études floristiques se sont progressivement étendues au recensement des plantes ornementales des jardins et des allées et à l'écologie du paysage urbain, toujours à la poursuite d'une meilleure connaissance, soit fondamentale soit appliquée. Ce type d'études – mieux développé dans les villes hébergeant une institution botanique – a permis d'une part l'élaboration de véritables «flores urbaines»; d'autre part, il a abouti aux synthèses modernes des notions de dynamisme et gestion de la diversité des espèces et communautés végétales, tant au niveau des villes et des territoires, en Italie et dans d'autres pays du sud de l'Europe. En particulier, on a pu constater que le milieu urbain, si d'une part il a tendance à globaliser, conduit dans d'autres à une diversification: en multipliant les habitats il peut accueillir des éléments exotiques en plus de ceux de la flore indigène, accroissant par là le niveau de diversité tant des espèces que des écosystèmes. Ce phénomène – en partie spontané et produit du hasard, en partie délibéré et voulu par l'homme – transforme les villes en de véritables réservoirs de la biodiversité végétale. En somme, dans un contexte urbain, le niveau de biodiversité tend à augmenter. Les villes méditerranéennes, avec leurs multiples couches historiques et culturelles, sont particulièrement réceptives à cet égard, ayant été en mesure d'accueillir des éléments de tous les continents. Une étude de Quézel & Médail (1995) a démontré l'importance, parmi les pays source des plantes ainsi établies, de celles dont le climat est de type méditerranéen: la Californie, le Chili, l'Afrique du Sud et le sud-ouest de l'Australie, tous connus pour la richesse de leur flore. Ces plantes, quand elles parviennent ou se cultivent dans les villes méditerranéennes, y peuvent prospérer et s'établir, contribuant ainsi à élever le niveau de la biodiversité. Par contre, l'impact des plantes d'autres origines géographiques est souvent négatif. Rappelons à cet égard les cas bien connus d'espèces exotiques envahissantes comme *Ailanthus altissima*, *Pennisetum setaceum* et, en Sicile, *Boerhavia repens* subsp. *viscosa*.

Green roofs and living walls – benefits and challenges

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The urban vegetation can restore the environmental quality of cities by reducing the Urban Heat Island effect, improving air quality and energy performance of buildings, managing storm-water, and fostering biodiversity. These benefits can play a key role, since four out of five European citizens live in urban areas, and their quality of life is directly influenced by the state of the urban environment.

Greening the building envelope can be a way to introduce more vegetation in dense cities. Vegetated roofs may use different plant species, for both their influence on architectural aesthetics and for achieving microclimatic improvements. Traditionally green roofs are widespread in northern Europe. The many products available on the market propose several integrated solutions for proper drainage, waterproofing, and roof protection depending on the vegetation type, such as grass and larger or smaller shrubs. For every type of green roof substrate thickness, maintenance needed, system weight, obtainable microclimatic benefits, influence on architectural aesthetic, costs and use are different.

Vertical greening systems are made by simple climbing plants, supporting structures for their growth or planter boxes placed at several heights with a shading function; others provide the possibility to cultivate species not naturally suitable for growing on vertical surfaces, thanks to the disposition of (pre-)vegetated panels, defined as “living wall systems”.

The vertical greening systems available on the market have very different formal and functional characteristics, performances and costs. Some systems can require high maintenance needs. Some plants may need to be replaced every year, panels can have a life expectancy of 10 years, automated watering systems need maintenance and plants need up to 3 litre/day per square meter; on the other hand a simple climbing plant has very low maintenance needs and may not require a watering system. These systems entail very different environmental burdens, due to maintenance, initial, and disposal costs.

In the Mediterranean area, vertical greening systems and green roofs can improve summer outdoor and indoor thermal comfort, mitigating the urban heat island phenomenon and reducing the energy demand for air conditioning. Green walls and green roofs are habitats for wildlife, with the potential to support life in a situation that would otherwise be largely barren and sterile. In general, greening the building envelope is a complex issue and implies a critical evaluation of the benefits obtainable in relation with the built space and climatic characteristics, durability, maintenance, and economic aspects.

Sustainable gardening and increasing invasive species, a paradox

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Using exotic plants is a common feature in gardening. Since time immemorial, attraction to the exotic is an inherent trait in human behaviour. Trade globalization has facilitated the introduction of new plant species, from any region, to any part of the world, thus using exotic plants in gardening is now much easier than some years ago.

At the same time, an increasing awareness of sustainable gardening, mainly because of the waste of natural resources such as water, has favoured more introductions of plant species, best adapted to local climates. In the Mediterranean region many species from Mediterranean regions of South Africa, Australia and California are introduced yearly. From these circumstances, a paradox results: doing more sustainable gardening, that is ecologically friendly, could promote the introduction of alien plants with a higher risk of becoming invasive. This threat comes, not only from the number of different species, but also from the different clones or ecotypes of a same species, that increases the ability to become adapted to a new region and also favours a rapid dispersal. The climate change scenario also plays an important role in this situation. Species, that now have low invasiveness risk, could become a serious threat in future years.

Identification of a problem is easy, but to propose solutions for it is quite often hard, especially when several economic sectors and professional collectives are involved (ornamental plant breeders, nurseries, landscapers, gardeners, etc.), even more so when awareness of a probable forthcoming situation has to be addressed.

Control of trade in exotic plants or banning them can be useful, but are not definitive or long lasting enough to represent a solution. From local experience, it seems that acting in a positive sense is much more efficient, and less conflictive. That is, to promote and develop actions addressed to people and specific professional collectives: raising people's awareness on the threat of invasive species, highlighting the local native flora as an important natural value to conserve, promoting the use of native plant species for local gardening, improving cultivation techniques, to allow cultivation of non Mediterranean plants, training and education of professionals on real sustainable gardening, that also takes into account also the risk of invasive species.

Iconographic floras and checklists – a tool for future research in Irano-Turanian floristic region

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Documentation of biodiversity has become an increasing task today in order to have reliable data on biogeography and conservation of a distinct area. There is a huge amount of herbarium material in museums which is still the basis for taxonomy and nomenclature. However, increasing difficulties in accessability of many regions and increasing administrative barriers make it necessary to use the good photographic tools of today. They enable us to make documentations without destroying habitats. Profiling of plant individuals can help not only in education but also as an amendment to herbarium sampling. Both approaches are preconditions for updating floristic checklists.

As an example we refer to the „Field Guide Afghanistan – Flora and Vegetation“ and to the „Vascular Plants of Afghanistan - an augmented checklist“. Both books have been produced to be distributed for free within the country to all universities, high schools, libraries, ministries etc. The effect is two-fold. On one side education and curiosity of pupils is enhanced, on the other side professional projects on environmental issues, on nature protection, on agriculture and forestry have a better and sound reliable botanical basis. Some interesting results on the flora of Afghanistan will be presented and discussed.

With digital cameras it is possible to make good collections of slides if some preconditions are fulfilled. In cooperation with botanical institutions iconographic guides can be produced and with taxonomists a checklist can be maintained and amended. In addition digital photographs can be stored in data-bases (e.g. plant-guides at Field-Museum Chicago etc.) and thus are available worldwide. There is already an appreciable though not sufficiant number of scientists working on systematics in the region. Their cooperation could produce field guides and checklists for specific areas. This is an urgent need for many parts of the Irano-Turanian floristic region.

Vegetation structure and diversity of Irano-Turanian flora in Kurdistan Region (N-Iraq)

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Kurdistan Region of Iraq is a rich territory in terms of flora diversity as a part of Irano-Anatolian hotspots. Its biogeographical location (intersection between Mediterranean, temperate, semi-arid and continental zones) and landscape heterogeneity (extending from Mesopotamia's plains to high mountains about 3600 m asl.) give rise to high floristic diversity values, including numerous important rare, endemic, threatened plant species. Phytogeographically, large parts of KRI are characterized by harboring of Irano-Turanian floristic elements with less species' number of Mediterranean and Siberian biogeographic origins. Despite many efforts during the last half-century of studying Flora of Iraq (Townsend & Guest 1966-1985), the knowledge of plant structure and diversity remains incomplete. Particularly, there are very few robust floristic studies attempt to update the Flora of Iraq. In this circumstance, the main research goals were to contribute new data on the distribution of plant species with a special focus on their biological conservation status. Our botanical approach was based on regular floristic field surveys started from the spring of 2013. The results highlighted the following important botanical points: (i) documenting the Irano-Turanian vegetation community structure from Mesopotamia's plains to thorn-cushion and alpine zone. (ii) analyzing diversity and distribution of monocotyledons (excluding *Gramineae*) (iii) contributing new revision of genus *Sternbergia* (*Amaryllidaceae*) and new contribution on Orchids (*Orchidaceae*) for Flora of Iraq (iv) investigating the ethnobotanical activities and their impact on vegetation structure. The easiness to find new records during a short period of botanical field surveys (2013-2015) confirms that KRI is hotspot for plant diversity but coldspot for knowledge, particularly in term of biodiversity conservation strategy and implementation.

Biogeography and diversification of *Euphorbia* subg. *Esula* (*Euphorbiaceae*): a species-rich lineage centered in the Irano-Turanian and Mediterranean regions

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As one of the four subgeneric clades of the megadiverse genus *Euphorbia* (~2000 spp), subgenus *Esula* comprises about 480 species of mostly annual or perennial herbs and constitutes the primary northern temperate radiation within the genus. Although the subgenus diversity is concentrated in the Irano-Turanaian region and the Mediterranean basin, members of the group also occur in other parts of the world, including areas in Africa, Macaronesia, the Indo-Pacific region, and the New World. Given its diverse and disjunct areas of distribution, subgenus *Esula* represents an interesting case to investigate the biogeographic origin and further range expansion of a Mediterranean-Irano-Turanian centered plant group. To further pursue this idea, we update the current phylogeny of subgenus *Esula* (273 taxa) by including additional representatives from the Irano-Turanian, Mediterranean, and North American regions. The topology obtained by analyzing a concatenated dataset of two DNA markers (nuclear ITS and plastid *ndh-F*) using a Bayesian approach was congruent with the available genus-wide phylogeny based on 10 markers where most clades of subgenus *Esula* were represented. We dated the new subgenus phylogeny through secondary calibration using the most recently published *Euphorbia* chronogram, and performed Bayesian reconstructions of ancestral areas and character states to investigate patterns of morphological and range evolution within subgenus *Esula* worldwide, and to assess the relevance of the Irano-Turanian and Mediterranean regions in the biogeographic history of this plant group.

Phylogenetic analyses of the Mediterranean genus *Verbascum* (*Scrophulariaceae*) inferred from cpDNA and nrDNA data compared to morphological data

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Verbascum L. (*Scrophulariaceae*) is a typical genus of steppic and Mediterranean vegetation and especially the Irano-turanian floristic region. We inferred phylogenetic relationships among *Verbascum* L. species from nuclear ribosomal internal transcribed spacer (ITS) and plastid sequences (matK plus *trn*L-*trn*F, *trn*S-*trn*G, *trn*H-psbA). Then we performed parsimony-based and Bayesian phylogenetic analyses to examine *Verbascum* species representing all the 13 taxonomical groups of Huber-Morath for the Flora of Turkey. Our molecular phylogenetic analyses strongly support monophyly of the *Verbascum* genus and the inclusion of species with four stamens previously set apart in the *Celsia* L. genus. Our aims were to confront molecular phylogenies to its traditional infrageneric classifications. However, most of the morphological characters used in classical taxonomy showed a poor fit when mapped on molecular trees and thus cannot be used to delineate natural infrageneric groups.

A phylogenetic and biogeographic study of the speciose Irano-Turanian genus *Acantholimon* (*Plumbaginaceae*)

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The spatiotemporal reconstruction of species diversification can reveal fundamental evolutionary mechanisms that operate on large temporal and spatial scales, and may help interpreting current patterns of biodiversity distribution, along with biogeographic patterns. *Acantholimon* is, after *Limonium*, the most speciose genus in the Plumbaginaceae. Its c. 200 species, mostly geographically restricted, are distributed from South East Europe to South West Asia, Central Asia, West Tibet and East Tien Shan; but the main center of diversity is the Irano-Turanian region. This region hosts a large biota adapted to extreme continental climates, which presumably was the source of steppic species that colonized the Mediterranean region via migration corridors during dry climate episodes. Its dynamic geological history -the result of the tectonic collision of three major plates, Eurasia, Arabia, and India- offers good opportunities to study patterns of episodic biotic interchange between independently evolving floras. Yet, the biogeography of the Irano-Turanian region has been scarcely studied, and *Acantholimon* is a suitable system for understanding the origin and evolution of its biota. We have generated datasets of two regions (ITS, *trn*Y-T) for 222 *Acantholimon* accessions and closely related genera, covering most of the previously recognized sections, and encompassing most the major areas of occurrence of the genus in Iran and Afghanistan as well as some areas in the eastern Mediterranean, the Caucasus and Central Asia. The main aims of our study have been: 1) testing the monophyly of *Acantholimon* with respect to its close genera, 2) inferring the relationships within *Acantholimon,* and 3) testing previous taxonomic hypotheses on intrageneric relationships. Furthermore we estimated the divergence times and used them for biogeographic and macroevolutionary analyses to determine the spatio-temporal pattern of lineage diversification and infer significant changes in diversification rates. Our results reveal a radiative scheme of diversification in *Acantholimon*, which seems to have been influenced both by intrinsic biological features of this group and by general abiotic factors across the Irano-Turanian region.

Visions of the past and dreams of the future in the Orient: the Irano-Turanian region from classical botany to evolutionary studies

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Ever since the 19th century, the immense arid lands of the Orient, now called the Irano-Turanian (IT) floristic region, attracted the interest of European naturalists with their tremendous plant biodiversity. Covering ca. 30% of the surface of Eurasia (16 000 000 km2), the IT region is one of the largest floristic regions of the world. The IT region represents one of the hotspots of evolutionary and biological diversity in the Old World, and serves as a source of xerophytic taxa for neighbouring regions.

Moreover, it is the cradle of the numerous species domesticated in the Fertile Crescent. In the intervening two hundred years, naturalists outlined different borders for the IT region. Yet, the delimitation and evolutionary history of this area remain one of the least well-understood fields of global biogeography, even though it is crucial to explaining the distribution of life in Eurasia. No comprehensive review of the biogeographical delimitations nor of the role of geological and climatic changes in the evolution of the IT region is currently available. After considering the key role of floristic regions in biogeography, we review the history of evolving concepts about the borders and composition of the IT region over the past 200 years and outline a tentative circumscription for it. We also summarise current knowledge on the geological and climatic history of the IT region. We then use this knowledge to generate specific evolutionary hypotheses to explain how different geological, palaeoclimatic, and ecological factors contributed to range expansion and contraction, thus shaping patterns of speciation in the IT over time and space. Both historical and ecological biogeography should be applied to better understand the floristic diversification of the region. This will ultimately require evolutionary meta-analyses based on integrative phylogenetic, geological, climatic, ecological, and species distribution studies on the region. Furthermore, an understanding of evolutionary and ecological processes will play a major role in regional planning for protecting biodiversity of the IT region in facing climatic change. With this review, we aim at introducing the IT floristic region to a broader audience of evolutionary, ecological and systematic biologists, thus promoting cutting–edge research on this area and raising awareness of this vast and diverse, yet understudied, part of the world.

ActaPlantarum, an amateur virtual community for the floristic and botanical knowledge sharing

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ActaPlantarum (www.actaplantarum.org) was founded in 2007 by a small group of botany and photography amateurs with the aim to create a place where everyone can grow, develop and share passions and knowledge.

ActaPlantarum is not an association or a legal entity, it is self-funded, it doesn't contain any advertising, it doesn't receive contributions from any external organization.

The spirit that joins those who share the ActaPlantarum experience is based on two beliefs:

- the development of a shared project and the free flow of information enables the personal enrichment and the dissemination of the floristic culture in Italy;
- between the academic and highly specialized world of research and the territory explorations, there is a wide space that can be occupied by those who have good will, curiosity and availability to explore and learn, as well as to share the results.

The potentiality offered by an open forum and the ability to attach images to the discussions have quickly grown the number of amateurs letting grow, at the same time, the number of images and news concerning the Italian spontaneous flora.

Today's numbers are the proof that our beliefs are correct.

The forum is supported by a photo gallery where about 75% of the Italian wild flora species are represented; an illustrated glossary of more than 2000 botanical terms and an etymological dictionary, containing almost 14000 words are provided on dedicated pages.

IPFI (Index Plantarum Florae Italicae), born from the need of a taxonomic stable and shared reference, is definitely the most updated Italian online database regarding the regional distribution of botanical taxa.

The forum contains nearly 70,000 reports relevant for Italian presence of wild flora species, of which at least 500 are new reports for an Italian region or Italy itself.

What holds together ActaPlantarum is the spirit of sharing: the knowledge by itself has little worth, if not shared, to improve ourselves, the listeners or readers and in general all the world around. The knowledge is also responsibility. The knowledge is the basis for the conservation, for a sustainable and durable use. This is another dimension that joins those who are working together in this project.

Flora Catalana: Un point de rencontre pour les amateurs de la botanique

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Flora Catalana est une association catalane qui a pour objectif principal de regrouper le travail effectué par des amateurs dans le monde des plantes et par des chercheurs voire des professeurs universitaires. Il envisage également d'être un point de rencontre pour tous ceux qui aiment les plantes et la nature et qui veulent connaître les végétaux sous tous leurs aspects (utilisation, habitats, etc).

L'Association gère un site Web (http://www.floracatalana.net), qui contient à la fois des informations strictement botaniques et des utilisations de plantes (ethnobotanique) ainsi qu'une vaste galerie d'images prises sur le terrain et en laboratoire.

Flora Catalana travaille en groupes distribués sur tout le territoire catalan et on organise des activités, comme par exemple:

- Ateliers et séminaires pour une meilleure connaissance des plantes.
- Sorties botaniques périodiques.
- Parcours botaniques spécifiques.
- L'utilisation du point de rencontre de la communauté, Floracatalana.net sur Google+ (http://bit.ly/Zr0AaQ).
- Élaboration d'un glossaire de termes botaniques avec des images.
- Mise au point de clés dichotomiques visuelles.
- Rédiger des formulaires pour classifier des usages ethnobotaniques des plantes.

The WIKIPLANTBASE project: the role of amateur botanists in building up large online floristic databases

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Online data basing of plant diversity data became one of the major issues in biodiversity informatics in recent years. An increasing number of databases is now available concerning nomenclature and taxonomy, herbarium specimens, invasive alien plant monitoring, ecology, vegetation, chromosome numbers, plant rDNA sites, genome size, DNA sequences. On the contrary, there are still few publicly available databases storing floristic data, especially at local level. Floristic records provide baseline data for researches in plant biology, linking a certain systematic unit to the localities where it is known to occur. As printed sources - like e.g. floras - are quickly outdated, researchers must look for updated data in the scientific literature and herbarium specimens.

In consideration of this, in 2013 we have started the project "Wikiplantbase #Toscana" to provide a framework where the full set of georeferenced floristic records of Tuscany can be entered, stored, updated and freely accessed through the Internet. Mainly thanks to the collaboration of amateur botanists, in few months, thousands of data accumulated and the next year "Wikiplantbase #Sardegna" went online and was quickly populated with floristic records, mostly by amateur botanists.

As of 10 February 2016, Wikiplantbase #Toscana is storing 97354 verified floristic records, and Wikiplantbase #Sardegna 37437. Concerning the taxonomic coverage, for more than 90% of specific and subspecific taxa known for Tuscany there is at least one record available; while for Sardinia to a lesser extent, is still about 50%, but rapidly growing. The most recorded species are, so far: *Erica arborea* L. (*Ericaceae*) for Tuscany (387 records from 286 different localities), and *Pistacia lentiscus* L. (*Anacardiaceae*) for Sardinia (331 records from 217 different localities).

Stored floristic records are based on published literature (ca. 80%), herbarium specimens (ca. 16%), and unpublished field observations (4%). All records entered by collaborators are submitted to the project coordinators, who are enabled to accept, modify, or reject them.

With minor software tweaking, the online platform Wikiplantbase might be adopted in other contexts, resulting in a well connected network of regional floristic databases suited to exploit the involvement – still largely untapped – of non-academic collaborators, as advocated by citizen science.

Tela Botanica: the network for Francophone botanists

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For more than fifteen years now, *Tela Botanica* has been giving botanists the opportunity to pool their knowledge via the Internet and has been supporting them to boost the setting up of collaborative projects at Francophonie level. The *Tela Botanica* network currently gathers about 28 000 members in more than a hundred countries worldwide, over 20 000 of whom have registered to its weekly newsletter.

The set of tools and projects proposed by *Tela Botanica* revolves around a range of taxonomic databases that have become the system's « backbone ». As far as Metropolitan France is concerned, it is around the French tracheophytes database, updated by members on a regular basis, that such tools have been developed in order to feed in observations (*Carnet en Ligne* : Online Notebook) and to confirm determination contents in a collaborative way (*Identiplante)*, so as to ultimately visualize relevant data on scalable maps. *eFlore* is an online encyclopedia that comprises significantly broad theoretical knowledge and technical know-how proposed by the network members; it provides entries for scientific names as well as vernacular names in 8 European langages. *eVeg* is another database that addresses the description of syntaxons for metropolitan vegetation. The latest ongoing project considers giving « French standardized names » to France's flora as a whole, thanks to the use of keys for « genera in French » based on the recently-published seminal reference book *Flora Gallica*. All the data gathered by the network members are to be disseminated under free license in order to increase their use value.

Researchers in botany and ecology will also rely on the network within various citizen science programs in order to monitor the evolution of biodiversity and climate change. As a consequence, *Tela Botanica* is strengthening its partnership with the research community while acting at the interface between academic circles and civil society.

Thanks to years of longstanding experience, *Tela Botanica* currently intends to make its tools available in other parts of the world by integrating newly-designed taxonomic databases (West & Central Africa, North Africa, French West Indies, Réunion island, New Caledonia, among others). In 2015, *Tela Botanica* and *Lebanon e-Flora* set up close collaboration for Lebanon's contributors to directly upload their data in an online Notebook pertaining to their own territory.

Last but not least, *Tela Botanica* is planning to operate a MOOC botany course (Massive Open Online Course) in 2016 throughout the Francophonie area. This course is to be conducted in partnership with seven countries. Its goal is to trigger an interest in botany for a large audience by providing the necessary bases for the practice and development of this discipline in an attractive learning environment.

Les sciences participatives au service du Système d'Information sur la Nature et les Paysages (SINP)

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Le Système d'Information sur la Nature et les Paysages – SINP – est une politique d'état visant à faciliter la mise en commun et la diffusion de données naturalistes entre différents acteurs : services de l'état, professionnels (bureaux d'études), grand public et monde associatif. Il est organisé en plusieurs pôles thématiques sous l'égide d'un Conseil scientifique régional du patrimoine naturel.

Dans la région Languedoc-Roussillon, le Conservatoire botanique national méditerranéen de Porquerolles (CBNMed) assure la tête de réseau pour le pôle thématique « flore et habitats naturels ». Le CBNMed met à disposition environ 1 million de données floristiques provenant d'une large palette de producteurs : experts du CBNMed, botanistes amateurs structurés en réseaux ou en associations, bureaux d'études, monde de la recherche... Cependant un type de producteurs de données n'est pas encore associé à cette centralisation des données : le grand public des botanistes isolés, acteurs potentiels des sciences participatives.

Parmi les outils mis à disposition des sciences participatives, le « carnet en ligne » de Tela-Botanica a retenu notre attention. Il a déjà permis d'agréger environ 80 000 données pour la région Languedoc-Roussillon.

Une analyse de ces données a été faite en vue d'une future intégration dans le SINP. Elle concerne dans un premier temps la validité de ces données - toutes les données fournies par les sciences participatives ne peuvent être considérées comme fiables *a priori* - et dans un deuxième temps l'évaluation du bénéfice que ces données sont susceptibles d'apporter au SINP : données nouvelles pour certains territoires (communes), données actualisées (plus récentes) ou géographiquement plus précises. Ce sont ces résultats que nous présenterons et qui permettent d'intégrer une démarche citoyenne dans une politique partagée de l'état.

L'arrivée des amateurs dans les réseaux botaniques: l'expérience de Tela Botanica en Algérie et Tunisie

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La mise en place du forum Tela Botanica « Afrique du nord » en 2002 a été l'occasion de mieux connaître la communauté botaniste, notamment en Algérie et en Tunisie. Elle était initialement composée d'universitaires, majoritairement maghrébins et minoritairement européens. Depuis 2011, l'arrivée de plusieurs amateurs est venue modifier le paysage et dynamiser le forum. Très actifs, demandeurs et partageurs, ces nouveaux acteurs, encore peu nombreux, participent d'ores et déjà à la cohésion de la communauté et à l'émergence d'un savoir commun et transversal. Ils nécessitent souvent un complément de formation que certains professionnels leur fournissent via le forum, et qui bénéficie en retour aux étudiants qui y sont inscrits. Le développement de la version Afrique du Nord du Carnet en Ligne par Tela Botanica en 2013 a fourni aux botanistes maghrébins l'occasion de pratiquer la saisie et le partage de données (observations originales sur le terrain, avec ou sans illustration). La pratique de l'outil se développe lentement mais les amateurs sont déjà parmi les utilisateurs les plus réguliers et contribuent ainsi à la constitution d'une base de données très prometteuse. Aujourd'hui les plus expérimentés d'entre eux contribuent à effacer les frontières entre amateurisme et professionnalisme et participent à la collecte de données de qualité et désormais à leur publication. Cet objectif de valorisation est un des principaux objectifs de progression à envisager à l'avenir, besoin partiellement partagé avec la communauté professionnelle.

Analyse de la dynamique post-incendie de la série du chêne liège (*Quercus suber*, *Fagaceae*) de la forêt domaniale de Mizrana (wilaya de Tizi-Ouzou, Algérie)

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La forêt domaniale de Mizrana (wilaya de Tizi-Ouzou, Algérie) est constituée de chêne-liège (*Quercus suber* L.) et s'étale sur une superficie de 2 233 ha. Par l'approche indirecte ou synchronique, une étude de la dynamique post-incendie de cette subéraie a été entreprise durant le printemps 2014, dans le but d'analyser l'influence du passage du feu sur la composition floristique et la structure de la végétation en fonction du temps. La chronoséquence retenue correspond à 4 sites choisis en fonction d'une succession d'âge post-incendie (2012, 2006, 2000, 1997) et un site épargné par le feu depuis plus de 30 ans.

Le traitement de la matrice des données floristiques (110 relevés et 159 espèces), à l'aide de l'analyse factorielle des correspondances et de la classification hiérarchique ascendante, a permis de mettre en évidence l'existence d'un gradient dynamique et une évolution progressive des subéraies incendiées, du stade herbacé vers un stade de maquis arboré, puis vers une formation préforestière, pour aboutir à une subéraie mûre au bout d'une période de 17 années après feu. Cette analyse de la dynamique de la végétation et de l'évolution du cortège floristique traduit une tendance à la cicatrisation de la végétation, confirmant le modèle de la « composition floristique initiale » *sensu* Egler. Il apparaît clairement que les subéraies ont une forte résilience aux incendies et ont tendance à rejoindre l'état initial préexistant au feu. In fine, si la perturbation de type feu n'est pas trop rapprochée dans le temps, celle-ci possède un impact fugace sur la végétation et permet sa reconstitution selon les schémas évolutifs classiques, où la part de la régénération végétative reste majoritaire dans le processus de reconstitution de ce type d'écosystème forestier méditerranéen perturbé.

Incendie, pâturage et biodiversité dans la montagne du Gennargentu (Sardaigne)

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La Sardaigne, comme la plupart des îles et des côtes méditerranéennes, a une longue tradition d'élevage à l'état libre, encore très répandue. Le pâturage est généralement lié à l'incendie pastoral ce qui peut souvent changer radicalement le paysage végétal.

Dans le libre pâturage, et de façon systématique jusqu'au un passé récent, l'incendie était une pratique pastorale commune dans le but de favoriser la croissance de la masse herbeuse ou la repousse des drageons comestibles des arbustes. Cependant, dans le même temps, le feu favorise les espèces avec un grand nombre de graines résistants aux températures élevées, avec l'adaptation des formes biologiques et avec la production de substances aromatiques, toxiques ou répulsives pour le bétail. Dans le domaine du Gennargentu, on a analysé les relations dynamiques entre les différents types de végétation en ce qui concerne les incendies et le pâturage, les différentes composantes floristiques des communautés végétales et des habitats, des espèces comestibles et de celles rejetés par le bétail. Une attention particulière a été accordée aux espèces endémiques qui constituent l'élément caractéristique de la flore de cette montagne.

Les habitats des prairies et garigues des zones les plus élevées sont ceux de plus grand intérêt qui coexistent et sont favorisés par le pâturage et le feu. *Juniperus sibirica*, *Santolina insularis*, *Astragalus genargenteus*, *Thymus catharinae*, *Genista corsica*, *Berberis aetnensis*, *Lamyropsis microcephala*, donnent lieu à des associations endémiques exclusives. Les habitats moins touchés sont ceux des rivières et des falaises, qui représentent un refuge envers les animaux et le feu.

Dans les zones les plus basses, la combinaison du pâturage et du feu conduit à la communauté à *Juniperus oxycedrus*, tandis que les maquis à *Erica arborea* et *Arbutus unedo* et à *Erica scoparia* proviennent en grande partie de la dégradation des forêts de Quercus pubescens et Q. ilex. La présence de l'habitat à *Taxus baccata* et *Ilex aquifolium*, très vulnérable au pâturage et au feu, est une caractéristique significative des zones les moins accessibles à ces perturbations, au niveau des rochers et des zones humides. Pâturage et feu représentent un obstacle important à la conservation des formations climaciques, mais ils constituent, dans le même temps, deux facteurs essentiels à la sélection et la dispersion de nombreuses espèces endémiques

Post-fire restoration of Mediterranean forests: helping autosuccession

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In the Mediterrancan forcsts, forcst fircs havc bccomc thc most frcqucnt disturbancc of ecosystems, particularly in the recent decades during which there has been recorded an increase in the number, severity, burned area and recurrence of fires and the length of time of fire risk, due to the global climate change. This could even lead to our forests to the permanent establishment of early successional stages, especially in areas where vegetation is less well adapted to these episodes. In recent decades, large fires devastated a large area of forest in Southern Europe, so many studies began to track long-term response of natural regeneration or reforestation of forests of pine (*Pinus halepensis*, *P. pinaster*, *P. brutia*) and holm oak (*Quercus ilex*) and possible improvements that could be obtained depending on the administration and management applied in these areas. The management of Mediterranean forest must introduce new variables and include the objectives maximizing called indirect benefits or extemalities, which are particularly important in these areas of low economie production. Therefore, it should include all the values that the Mediterranean forest produce, such as landscape, rural tourism, flora and fauna biodiversity, $C0_2$ storage, protection against erosion, etc.

The analysis of plant diversity should be done through indexes and models to value it and relate these variables and the subsequent management. Mediterranean plant specieshave developed adaptations that allow them to withstand fires without these entail the disappearance total community death of individuals or the ability to recover naturally and back earlier successional stage towards the fire (resilience), through the production of sprouts or seed bank. Among the different strategies of plant species of Mediterranean forests include resprouting (*Quercus*), germination capability (*Pinus, Cistus*), thickening of the bark (*Quercus suber*), etc. This high responsiveness is taken into account when designing a restoration plan after :fire. Forest restoration is a global concept that may have different degrees and intensities of management intervention, depending on the degradation stage of the forest and the specific management objectives considered. In the past, forest restoration has been mostly interpreted as planting trees~that is, afforestation or reforestation. Nowadays, depending on the local conditions and objectives for the burned areas, these are often not the best management alternative Active and Indirect (Passive and Assisted) Restoration and the concepts of Rehabilitation and Replacement must be also considered whithin a multi-functional point of view of the Mediterranean forests.

Native plants in Serbia as a source of new antiinflammatory agents - the case of the *Polygonaceae* family

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Herbal medicine has a long tradition in Serbia. According to the last estimates the flora of Serbia contains 3662 taxa, which makes Serbia a country with very high floristic diversity compared to other European countries. Although more than 700 species are considered as medicinal only 10% are officially registered. This is why exploration of new plant species possessing considerable biological and pharmaceutical activities attained considerable focus.

The *Polygonaceae* family comprises 43 genera and nearly 1100 species. In Serbia plant species of *Poygonum*, *Rumex*, *Persicaria* and *Bistorta* are widely distributed and were popular in traditional medicine of the natives. These plants are found to possess laxative, diuretic, analgesic, antipyretic, curative, anti-inflammatory and antibacterial properties. Besides, some of the species are also used in preparing and cooking food, salads, and spices. However most of these species are still unexplored. In this study we report on anti-inflammatory potential of several *Polygonaceae* species: *Polygonum* sp. (*P. aviculare* and *P. maritimum*)*; Persicaria* sp. (*P. amphibia P. hydropiper , P. lapathifolium, P. maculosa*)*; Bistorta* (*Bistorta officinalis*) and *Rumex* sp. (*R. patientia , R. acetosa , R. acetosella, R. crispus, R. obtusifolius* and *R. balcanicus*).

Plant material (rhizome and herb) was collected from different localities in Serbia in period of 2010-2012. The investigation of following plant species was undertaken: Air-dried and smoothly grounded herbal samples were extracted by maceration with 80% MeOH during 72h. Extracts were concentrated to dryness and dissolved in DMSO. Chemical profile of each sample was explores by the means of LC-MS/MS. Anti-inflammatory potential was determined by *ex vivo* COX-1 and 12-COX assay. Human platelet was used as a sources of cyclooxygenase-1 (COX-1) and 12-lipooxygenase (12-LOX) enzymes. Highly sensitive LC-MS/MS technique was used for determination of 12(S)-hydroxy-(5Z,8E,10E)-heptadecatrienoic acid (12-HHT) and 12(*S*)-hydroxy-(5Z,8Z,10*E*,14Z)-eicosatetraenoic acid (12-HETE), inflammation mediators derived from arachidonic acid metabolism, catalyzed by COX-1 and 12-LOX, enzymes of inflammatory response.

Polygonaceae plants, especially herba of *Persicaria lapathifolia* (COX-1 and 12-LOX) and rhizome *Rumex balcanicus* (COX-1)*,* possess high anti-inflammatory activities considering their ability to inhibit COX-1 and 12-LOX. Their activity was nearly to quercetin, well-known anti-inflammatory agent and might be an interesting candidate for developing new phytopharmaceuticals and dietary supplements.

Results from the studies performed on Eastern Mediterranean *Lamiaceae*

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Lamiaceae are rich in isoprenoids (mono-, sesqui-, di-, triterpenoids) in addition to iridoids, flavonoids, hydroxycinnamic acids, *p*-coumaric acid, ferulic and caffeic acids derivatives. The terpenoids as well as the caffeic acid derivatives have been of potential taxonomic value for the family *Lamiaceae*. Two previous articles have been the lead for the studies which are presented here. The first one reported the taxonomic importance of the distribution of the caffeic acid derivatives in plants (Harborne 1966). The second one was reported by Cantino (1991) in which *Lamiaceae* has been classified into eight subfamilies; *Ajugoideae* (AJ), *Chloanthoideae* (CH), *Lamioideae* (LA), *Nepetoideae* (NE), *Pogostemonoideae* (PO), *Scutellarioideae* (SC), *Teucrioideae* (TE) and *Viticioideae* (VI). Moreover, it is well-known that NE is oil-rich while LA is oil-poor. Volatile terpenoids and iridoid glycosides provide useful markers among the plants of different subfamilies of *Lamiaceae*.

Along the above mentioned lines, the phytochemical and biological activity studies have been performed on the plants selected from various subfamilies of *Lamiaceae* [*Ajuga* (AJ), *Eremostachys* (LA), *Galeopsis* (LA), *Lamium* (LA), *Leonurus* (LA), *Marrubium* (LA), *Phlomis* (LA), *Scutellaria* (SC), *Sideritis* (LA), *Stachys* (LA), *Teucrium* (TE)], Most of these plants are known as herbal drugs in traditional medicine and some of them are used as herbal tea in Turkey as well as in Cyprus. Among the plants studied, all *Phlomis* species represented by 33 species in the flora of Turkey have been studied in respect to their content of iridoids and caffeoyl ester glycosides.

In this presentation, a brief summary will be given on the studies performed on the above mentioned *Lamiacaee* plants during the last 30 years.

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Useful plants of Southern Europe

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Over the last forty years, they have been published hundreds of papers and books covering the useful plants of Italy, Spain, France and Portugal. Focus was set on traditional uses and wild plants. Thus, rural areas and natural parks and reserves were the main zones where research was conducted. Ethnobotany and ethnopharmacology were more commonly adopted approaches.

With regard to ethnic and linguistic groups numerous are the works devoted to the study of names and uses of plants in various ethnic minorities (Grecanic, Arberesche, Mocheni, Ladins, Cimbrians, etc.). Dictionaries have been published of names of plants in Catalonian, Occitan, Franco-Provencal, and others are on the way.

During the las twenty years gathered wild food plants and local foods were paid special attention in connection with their potential as healthy foods or even nutraceuticals, but also on account of their cultural relevance among local communities. These studies involved not only fieldwork and collection of recipes but also phytochemical screening and pharmacological research.

Medicinal plants were subject to numerous studies ranging from the recording of traditional uses (including gathering practices and prescriptions for preparation and administration) to more sophisticated laboratory studies. The European Medicines Agency issued the European Union herbal monographs based on the scientific opinion of the Committee on Herbal Medicinal Products considering traditional use. These monographs represent a way of formalizing long-standing use and experience of medicinal plants in the European Union. However still is much to be done to make available to the urban population in Southwest Europe the wealth of local medicinal plants with criteria of safety and efficacy.

Local cultivars or landraces of cultivated plants, mostly vegetables and fruits, attracted the attention of many researchers. These published numerous studies, especially well illustrated books, addressed to raise awareness of this diversity and contribute to their conservation and sustainable use. This work has contributed to the emergence of appellations of origin based on those varieties with relevance in the local economies and the development of specialized collections and nurseries.

In recent years, there have been several books and projects devoted to the review and synthesis of the available information, being noteworthy the Spanish Inventory of Traditional Knowledge Related to Biodiversity.

Useful Mediterranean aromatic plants and essential oils

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Aromatic plants are plants containing substantially high levels of essential oils. Also, those plants that can generate an aromatic product by some physico-chemical processing are considered aromatic. Essential oils are odorous products, usually of complex composition, obtained from a botanically defined plant raw material by steam distillation, dry distillation or a suitable mechanical process without heating. Typical aromatic plant containing families, such as *Lamiaceae*, *Apiaceae*, *Asteraceae* or *Pinaceae*, are well represented in the Mediterranean flora.

Aromatic plants and essential oils have a wide range of uses for human welfare, including health care, cosmetic and perfumery, and food industry.

Essential oils are chemodiverse mixtures, which can contain a wide variety of chemical compounds (monoterpenes, sesquiterpenes, phenylpropanoids and other non-terpenic compounds) with different chemical structural features (non-cyclic, alicyclic or aromatic, different number of cycles), including a variety of chemical functions (alcohols, phenols, esters, aldehydes, etc.). In addition, quirality of the compounds can also play a role in the activity. This chemical diversity explains the huge range of pharmacological activities: antibacterial, antifungal, antiviral, expectorant, spasmolytic, carminative, choleretic/cholagogue, sedative, analgesic and anti-inflammatory, among others.

Phenol monoterpene containing essential oils, such as thyme, oregano and Spanish oregano oils, are among those with higher antibacterial and antifungal activities, which are mainly related to thymol and carvacrol. Other constituents, such as p-cymene, even being inactive by themselves, can act synergistically with the former. Other structure types can also show high antifungal activities, as is the case of nonadiyne (alkyne) and jaeschkanadiol benzoate (sesquiterpene ester), which have been described from the root of *Ferula hermonis* Boiss.

Main areas of medicinal application of essential oils and aromatic plants are disorders of the central nervous system (lavender flower and oil, melissa leaf, valerian root, Spanish sage oil, etc.), respiratory system (thyme, anise, fennel fruit, turpentine oil) and gastrointestinal system (matricaria flower, anise, fennel, melissa leaf, rosemary leaf, peppermint leaf), as well as rheumatic and muscular pain (turpentine oil, rosemary oil, thyme oil), and skin and mucosa complaints (matricaria flower).

Last, but not least, in addition to the antiseptic activity, immunomodulatory and antioxidant activities of the essential oils can be relevant for their use as feed additives.

Useful plants and landscape changes in the Mediterranean area

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As useful plants we refer to all the plants that are used by humans to fruitful particular needs. The main uses of plants are: food, medicine, fodder, building material, textiles, ornament, forestry and biomasses. Plant material can be collected in the wild or most commonly from cultivation. The collection in the wild of useful plants can have low impact on nature (e.g. myrtle (*Myrtus communis*) fruit collection in Sardinia for cooking and for spirit or wild asparagus (*Asparagus* sp. pl.) in the whole Mediterranean for cooking) or can strongly threaten plants and habitats – e.g. orchids collection in Eastern Mediterranean for salep production or gentian (*Gentiana lutea*) and masterwort (*Peucedanum ostruthium*) collection in Italy for medicine.

Humans, with the shift from the collection of wild plants to the crop cultivation, which took place in the eastern Mediterranean basin, around 11000 BP, carried out the first main landscape revolution. The evergreen forest vegetation, relatively poor in species, was replaced by open areas with rich grass vegetation that previously was limited to marginal habitats.

The first and most widely cultivated useful plants were cereals, legumes and woody Mediterranean species as olive (*Olea europaea*), arbutus (*Arbutus unedo*), grape (*Vitis vinifera*) and fig (*Ficus carica*). In this way was reached a Mediterranean garden model that developed in Greece in the mainland and in the surrounding archipelagos.

The cultural influence on traditional landscape in the Mediterranean is among the longest and deepest in the whole world, but rural areas, in the last decades are increasingly being depopulated and abandoned or converted in urbanized or industrial areas. The Mediterranean region has around one third of agricultural land, including grasslands. Vegetable production is increasing, largely in green-houses. Forests and other wooded land, scrub and heathlands dominate more than half of the region. The total area covered by woods and shrubs has increased over the last decades. This increase is due to active reforestation but it is also the result of abandonment of agriculture. Traditional agricultural landscapes are now universally considered heritage to be preserved so that some areas with traditional agricultural landscapes are included by UNESCO among the world heritage sites. In addition the management of the traditional agricultural landscapes plays an important role also in wild biodiversity conservation. Thus is strengthened the importance of preserving peculiarities against trivialization and homogenization of the landscape as happened in the large part of coastal areas with urban and touristic development and in the inland with extensive monocultures. Distinguishing examples of landscapes that should be preserved and somehow expanded are those characterized by: citrus grove in Sicily and South Italy, cultivation of lavender (*Lavandula angustifolia*) in Provence, mastic (*Pistacia lentiscus*) cultivation in Chios island, terraced agriculture in many islands and hilly areas, etc. This would result in overall long-term benefit to nature and to the economy of the local people.

Parallel bursts of recent and rapid radiation in the Mediterranean and Eritreo-Arabian biodiversity hotspots as revealed by *Globularia* and *Campylanthus* (*Plantaginaceae*)

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Dated molecular phylogenies and biogeographical inferences have become increasingly important to test hypotheses of the temporal and geographical origin of plant lineages from the Mediterranean region (MR) and their rates of diversification. However, explicit comparisons of diversification rate and biogeographical histories between well-sampled clades within and outside the MR are still rare. Here, we use a woody perennial clade of Plantaginaceae for comparison of the diversification rate and biogeographical histories between the MR (*Globularia*: 27/23 total/MR spp.) and the Eritreo-Arabian region (EAR; *Poskea*: 2 spp.; *Campylanthus*: 18/15 total/EAR ssp.). To this aim, we generated a time-calibrated and near-complete species-level phylogeny of the entire clade, based on chloroplast and nuclear (ITS) DNA sequences, for subsequent analyses of within and among-clade diversification (e.g., Laser, Bayesrate, Diversitree) and ancestral area reconstructions (AARs).

Our results indicate that *Globularia* and *Campylanthus* qualify as evolutionary 'radiations', thereby providing the first evidence for a common period of recent and rapid plant diversification in, respectively, Mediterranean-climate (MR) and arid (EAR) environments at the Plio-/Pleistocene boundary (*c.* 3.3 vs. 3.5 Ma). However, despite their different distributions, environments and range sizes, *Globularia* and EAR *Campylanthus* exhibit strikingly similar rates of constant lineage accumulation (*c.* 0.81–1.12 vs. 0.63–0.97 spp. myr^{-1}). Our results further demonstrate that the Macaronesian species of *Globularia* are neither ancient relicts of the Tethyan-Tertiary flora, nor is their disjunction relative to the genus' EAR sister genus *Poskea* the result of climate-driven vicariance of the same era. By contrast, neither late Plio-/Pleistocene vicariance nor dispersal-mediated range evolution can be refuted for Macaronesian–EAR *Campylanthus*.

We conclude that the parallel radiation of *Campylanthus* and *Globularia* at the Plio-/Pleistocene boundary fits well with a scenario in which the coupling between low- and high-latitude climate shifts has triggered a simultaneous diversification in the EAR and MR, respectively. The 'out-of-Africa' migration of *Globularia* into the extensive and eco-geographically complex MR (*c.* 9.6–3.3 Ma) may have increased diversification rates and contributed to the genus' higher species richness and adaptive phenotypic disparity relative to *Campylanthus* and *Poskea*. Concomitantly, the immediate ancestors of both latter taxa may have escaped extinction in the EAR through adaptation in response to an increasingly more arid climate since the mid-Miocene (*c*. 17–15 Ma). If so, putative earlier lineages of the entire clade were likely adapted to more humid climates and/or denser vegetation, but suffered from extinction and/or long-term periods of stasis.

Inferring refugia and migration process of a Mediterranean thermophilous shrub in response to past climate changes

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Phylogeography and palaeoecology have revealed the long remanence and the complexity of evolutionary and ecological processes shaping the Mediterranean flora. Nevertheless, the precise response of Mediterranean plants to past abrupt climatic changes remains poorly investigated, especially for thermophilous plants growing in coastal areas.

Here, we examine the eco-biogeographical responses and past range dynamics of a key thermophilous Mediterranean shrub, *Myrtus communis* (*Myrtaceae*) combining distribution modelling, palaeoecology and phylogeography based on chloroplast and nuclear DNA sequences with AFLP data. The challenge is to better understand the survival of the Myrtle, confronting both distribution stability and genetic imprints, since its phylogeography reflects the accumulation of the species' responses to successive Cenozoic palaeoenvironmental changes.

A deep divergence is still detected in the genome of current populations, indicating that three phylogroups could have evolved independently during the Quaternary, but come into contact recently. Palaeodistribution modelling predicts a strong spatial range contraction of *Myrtus* during the last glacial maximum toward Southern refugia, below the 41°N latitude and mainly on the Western and Eastern limits of the range (Atlantic/Levantine shores). Levels of genetic diversity support also the hypothesis of long range migrations occurring along the coast and across sea channels especially in the Western Mediterranean during suitable interglacial climatic periods. Developing an integrative phylogeography thus highlights the striking ability of a thermophilous shrub to persist locally and to migrate despite drastic Mediterranean environmental changes.

Hybridization in the *Triticum-Aegilops* species complex (*Poaceae*)

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The domestication of wheat (*Triticum* sp.), one of the major crop presently cultivated, results from allo-polyploidization events involving several *Aegilops* species. The reproductive isolation between both genera is incomplete: *Aegilops* species are traditionally used in wheat breeding and intergeneric hybrids are regularly reported along wheat cultivations. Despite these observations, natural genetic introgressions involving wheat and *Aegilops* are poorly documented. This topic is however of great concern for risk assessment studies associated to the potential release of transgenic wheat. The present study investigates three European *Aegilops* species (*A. geniculata*, *A. neglecta* and *A. triuncialis*) and surveys natural Mediterranean populations. Samples collected along wheat field borders are compared to samples originating in areas isolated from agriculture. Several molecular markers (AFLPs, SSRs and sequencing of TE insertion sites) are used to assess the presence of wheat genetic markers in *Aegilops* populations. Various levels of introgression are revealed: *A. geniculata*, the most autogamous species, shows no clear evidence of gene flow from wheat, except for one *A. geniculata* × *Triticum* F1 hybrid discovered in a Spanish population. In contrast, numerous wheat genetic markers are observed in *A. neglecta* and *A. triuncialis*. Most introgressed samples originate from populations collected near to crop cultivations. In contrast, agriculture-isolated populations show little evidences of gene flow from wheat. Our study thus suggests that the release of commercial transgenic wheat in southern Europe should consider the possible introgression of transgenes within wild *Aegilops* populations.

Silene species (*Caryophyllaceae*) of the Mediterranean Basin: is there any difference between East and West for phylogeographic and speciation patterns?

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The presentation will focuse on the *Italicae* section, which has recently been shown to be monophyletic, with *S. gigantea* being excluded and forming a sister clade. The *Italicae* group now includes c. 29 species, some of which are small endemic (e.g. *S. nodulosa*, *S. auriculifolia*, *S. fernandezii* in the Western Basin; *S. cythnia*, *S. goulimyi*, *S. galataea* in the Eastern Basin), whereas others are widespread (e.g. *S. nemoralis*, *S. italica*, *S. andryalifolia*, *S. patula*).

Bayesian analyses were conducted to reconstruct the phylogeography of the widespread species, whereas a Bayesian species delimitation approach was applied to understand the origin of the small endemic taxa. Both analyses highlight an East-West pattern. All small endemics are well circumscribed in the Eastern basin whereas it is not the case for the Western ones. It is suggested that this pattern is due to a higher number of small islands in the East compared to the West and to a longer history of isolation and genetic drift in the former area.

The amount of genetic variation for each species was correlated with species distribution range, using chloroplast and nuclear markers. Our findings show that a large distribution range is not a good proxy of a high genetic diversity. According to our analyses large geographic distribution were often attained through recent range expansions associated with haplotype surfing, as it was the case for *S. patula* in Morocco or *S. italica* in several regions of the Mediterranean Basin.

Both the phylogeographic and the phylogenetic patterns that were observed evidence a very high morphological plasticity in the group, with several cases of morphological convergence among unrelated species. *Silene* species are known to be homoplasic for several characters and this is conformed here at the species and population levels.

Phylogeographic patterns in the Mediterranean region. An update

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A number of studies on phylogeography of Mediterranean plant groups have been released since a 2014 review on this topic. These studies highlight a diversity of patterns that is consistent with the amplitude of scenarios provided in the previous literature, which has repeatedly considered the Mediterranean to be a too complex biota to have simple phylogeographic patterns. However, there are also studies offering uncontroversial reconstructions of recent evolutionary history of Mediterranean species. Also, to some degree, one finds common elements in the new studies that support previous literature. Among the reinforced patterns, the most relevant are the atlantic - Mediterranean splits and the links between Tunisian/Algerian, Thyrrhenian, Provençal and Iberian-Mediterranean lineages despite current sea barriers. Some topics that continue to be classics are the role of straits as Gibraltar, the effects of the Messinian Salinity Crisis, or the focus on narrow endemics. Other topics that have received more attention than previously are the phylogeography of Eastern Mediterranean groups, the links between the Mediterranean and Irano-Turanian lineages, or a focus on topics such as edaphic differentiation. In addition to updating and summarizing phylogeographic patterns in the Mediterranean basin, some conceptual discussion is provided on the rationale for comparative approaches to phylogeography, in an attempt to encourage phylogeographic studies that have more accurate expectations.

Science for the new European Regulation on invasive alien species

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The European Regulation (EU) No 1143/2014 lays down rules to prevent, minimise and mitigate the adverse impacts of the introduction and spread, both intentional and unintentional, of invasive alien species (IAS) on biodiversity and the related ecosystem services, as well as other adverse impact on human health or the economy. Member States have to take action to ensure that IAS at target (i) are not intentionally brought into, sold and bred or cultivated within the territory of the EU, (ii) are carefully monitored through a dedicated surveillance system and (iii) are subject to management actions aimed at eradicating, containing or controlling their populations.

All those actions should be underpinned by a sound scientific work that will produce biodiversity data, relevant expertise and technical tools. National scientific secretariats as already established in Great Britain and in the Netherlands deserve to be established for helping to coordinate the implementation of this new Regulation, and especially to enhance the cooperation and networking with scientists, to develop a dedicated IAS surveillance system, to gather, standardize and analyze distribution and management data, to identify priority pathways of introduction and spread, to identify and promote best management practices and to perform reporting tasks, including risk analysis reports.

Results of a few EU-wide studies will be presented in order to illustrate how scientists may help in conducting horizon scanning, risk assessment and risk management tasks in order to adequately prevent and reduce the damages caused by invasive alien plants in Europe and ensure efficient allocation of scarce conservation resources. Gaps in knowledge and research priorities will be also briefly addressed.

Improving management of weeds through a combination of participatory approach using citizen science and ICT tools

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A significant challenge to agricultural productivity is weed management. This is particularly important in tropical areas where weeds can cause at least 20% loss in the productivity of food and cash crops. To help stakeholders of the Western Indian Ocean in improving weed management, the WIKWIO (Weed Identification and Knowledge in the Western Indian Ocean) project has developed a particular combination of scientific approach and ICT tools. This project is a EU-ACP Science & Technology II program-funded action.

The WIKWIO initiative contributes to the establishment and strengthening of a community of stakeholders from research, education, extension and production around integrated weed management, by promoting knowledge sharing and collaboration. The action is aimed at enhancing capacities through an interdisciplinary and participatory approach, by building an ICT knowledge base of major weeds of food and cash cropping systems in the region.

The approach consists in sharing data and knowledge among stakeholders, helping people in weed identification, and providing information on weeds and their management. All these aspects are made available through the web 2.0 participatory bilingual (Fr/En) WIKWIO portal, http://portal.wikwio.org. From this platform, any visitor can identify a weed with the IDAO module and get information on a specific weed and its management from the Species module. Several working group modules provide weed management information for different cropping systems. Portal-registered members can provide knowledge on species and contribute to the species information DB, and also post field observations in order to contribute to weed distribution mapping. They can post observations of unidentified weeds to request help from the community for identification and give information on its management. Scientific or technical documents can be shared on the portal.

Members can comment on any piece of information present in the different modules of the portal. This comment can afterward become the starting point of a fruitful discussion.

The WIKWIO portal is linked to a couple of free mobile applications available for Android and IOS systems. The application WIKWIO IDAO is dedicated to weed identification, while WIKWIO Citizen Science concerns the posting and browsing of observations in the field.

After two years of work, the portal comprises a weed database of 350 species with a network of 466 registered members involved in weed management in the Western Indian Ocean region. We expect to extend the area of interest of the portal to the Sub-Saharan African region with the collaboration of the FAO.

Toward a citizen observatory on invasive alien plants

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The strategies for combating invasive alien species stress the importance of preventive measures which are generally more environmentally desirable and cost-effective than curative measures. Such prevention methods usually associate early detection and rapid responses to take accordingly (e.g., eradication, regulation of introduction pathways). The ongoing Regulation N°1143/2014 of the European Union is in this line and gives priority to tackling invasive alien species that are not yet present in the Union or that are at an early stage of invasion. This is why Member States will have to establish a surveillance system to collect and record data on the occurrence of invasive alien species of Union concern.

In France, general systems of surveillance of the territory are already organized by the Ministries in charge of Ecology and Agriculture. The 11 National Botanical Conservatories regularly survey the flora of their respective territory and coordinate a network of field botanists, gathering about 20 million observational data on the flora. Regional food authorities (SRAl) monitor 15 000 arable fields each year as well as non-cropped areas such as gardens and parks to detect new crop enemies including invasive plants. This first level of coverage of the territory could be the basic structure of the future surveillance system but should also be completed by a more targeted surveillance. At the same time, the number of observational data produced by the general public is growing, encouraged by the development of citizen science programs, new technologies and social networks. In the field of invasive species, observations from citizen can be complementary of official monitoring programs and increase the probability of early detection. In addition, such citizen observatories could also help to produce original research data and may be one of the best ways of raising the public's awareness. There is therefore an opportunity to organize a second level of surveillance based on citizen's observations.

This communication will present the project currently developed by Tela Botanica and Anses. Three examples of increasing complexity will show how citizen observatories can help i) detecting new incursions of invasive alien plants in Europe, ii) assessing the risk of potential invasive species (by providing information on seed viability, seedling recruitments near plantings, habitats colonized, …) iii) participating in impact assessments studies with a citizen science protocol.

Engaging the public in the management and control of invasive alien plants in the Mediterranean region: the LIFE project Puffinus in Tavolara (Italy)

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Many studies have emphasized the importance of human influence in the processes of plant invasions and the need of incorporating it into invasion models, risk assessments, national strategies and management plans. Human activities that deliberately or accidentally promote plant invasions are nowadays included both in the definition of pathway (UNEP/CBD/SBSTTA/18/9/Add.1 and UNEP/CBD/SBSTTA/20/INF/5) in the framework of the UNEP Convention on Biological Diversity, and in the legislation definition of invasive alien species, according the Regulation EU no. 1143/2014. The movement of plants across different regions is an ongoing and massive process and the Mediterranean region is not an exception. For other key processes such as dispersal and secondary release, anthropogenic variation, because of human preference for transporting, cultivating and hybridising particular species, can be orders of magnitude greater than natural variation. Other species, such as agricultural seed contaminants, can benefit from human activities through unintentional transport.

Consequently, assessing and understanding the role of human influences in plant invasions, and how these influences interact with plant invaders' biogeographic and biological attributes, could substantially improve our understanding of the invasion process. At the same time, the possibility to effectively apply a national strategy on plant invasions, as well as local action plans for species, both in the Mediterranean region as elsewhere, should be always supported by public awareness campaigns, stakeholders mapping and participation, educational activities, and collaboration with the media.

As a related case study, we will focus on the LIFE project Puffinus, which is taking place in the marine protected area of Tavolara (NE Sardinia, Italy - http://www.lifepuffinustavolara.it/). The main goal of the project is the protection of the breeding population of *Puffinus yelkouan*, one of the few species of seabird that occurs in the Mediterranean. The nest predation rate due alien Black Rats on Tavolara is currently unsustainable, and is likely to be the cause of the decline in P. yelkouan population over the last several decades. Additionally, the project aims to contain the population of feral goats, which currently has an extremely high impact on the island's vegetation, and to eradicate priority invasive alien plants (ranked using the Australian Weed Risk Assessment), which are currently present in limited numbers in the sector of the island most affected by human activities, but which could spread causing the loss of habitats of great conservation value.

État de l'art sur les plantes envahissantes ou à caractère invasif introduites en Algérie et en Tunisie

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Dans le contexte mondial ou régional du Bassin Méditerranéen, les invasions biologiques, constituent une menace continue pour la biodiversité, essentiellement dans des zones relictuelles classées comme points chauds. L'Algérie et la Tunisie, pays riverains et carrefours de biodiversité en Méditerranée, n'échappent pas de telles invasions. Néanmoins, aucun de deux pays n'a fait l'objet d'une synthèse relative aux espèces introduites, naturalisées et/ou invasives, sur son territoire. La présente étude des xénophytes (*sensu* Greuter) est ainsi entreprise en vue d'une meilleure connaissance des plantes invasives et potentiellement invasives en Algérie et en Tunisie. Elle fait le point des connaissances quantitatives (nombre de taxons) et qualitatives (composition taxonomique, types biologiques, origines biogéographiques, types d'habitats colonisés, degré de naturalisation) sur la flore allochtone présente sur le territoire Tuniso-Algérien.

Un bilan récent a permis de dresser (i) pour l'Algérie, une liste globale de 170 espèces vasculaires de xénophytes, appartenant à 122 genres et 42 familles. La plupart d'entre elles sont originaires de l'Amérique du Nord (26 %) et de la Méditerranée (21.2 %). Près de la moitié (44.7 %) des espèces allochtones sont des thérophytes et prédominent. Les champs et les cultures (44.7 %), les zones humides (14.1 %) et les décombres (11.8 %) sont les habitats ayant le plus grand nombre de plantes allochtones. La majorité de ces espèces sont des rudérales et se rencontrent dans des biotopes fortement perturbés. Les plantes introduites de façon accidentelle représentent près de la moitié (44.7 %) de la flore recensée. Une large proportion (45.29 %) de xénophytes est naturalisée en Algérie, avec environ 18 % d'entre elles considéré comme invasives ou potentiellement invasives (ii) pour la Tunisie, un total d'environ 98 taxons a été répertorié, appartenant à 33 familles, dont les plus riches sont les *Amaranthaceae* et les *Asteraceae*. Environ 82 % des xénophytes recensées sont des herbacées, dont 49 % des thérophytes. Près de 50 % de ces taxons ont une origine américaine, alors que les autres ont des origines diverses (sud-africaine, eurasiatique, australienne, etc.). Plusieurs taxons présentent un statut de plante envahissante et sont classés dans certaines listes internationales des taxons envahissants les plus redoutables.

Bien qu'encore peu élucidé, l'impact réel de certaines de ces xénophytes sur les communautés et écosystèmes mérite d'être évalué de façon urgente, via une diagnose minutieuse et permanente de la situation sur le terrain. Une règlementation vigilante envers l'introduction volontaire de taxons envahissants dans ces deux pays s'avère indispensable.

Poster presentations

Endangered medicinal plants in Turkey and their conservation strategies

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Conservation and sustainable use of medicinal plants plays a crucial role for the major cultural, vital and economic importance, in addition, in the protection of biodiversity. Medicinal plants are used mainly in three ways for the purposes of treatment; crude drugs, extracts and pure active compounds. According to WHO, about 80% of the population of mainly developing countries still use medicinal plant in their traditional medicines. Also modern pharmacopoeia contain at least 25% drugs derived from plants and many others which are synthetic analogues built on prototype compounds isolated from plants. Medicinal plants market sector is showing more growth over recent years and they are grouped particularly due to commercial reasons as "Medicinal and aromatic plants" (MAPs).

Many Wild harvested MAPs are collected in an uncontrolled manner and traded for commercial purposes in Turkey. This case is becoming more serious for plants whose underground parts are used such as geophytes, *Astragalus, Glycyrrhiza, Gypsophylla, Scolymus, Ferula/Ferulago/Prangos* genera including many endemic species.

Serious concerns on medicinal and aromatic plants occur such as reduction of biodiversity, habitat loss, resource depletion, genetic erosion, quality problems on the healthcare. Although some species protected internationally are covered in the CITES, the number of protected species is not enough. Initiatives for the protection of some rare species are conducted, but no terms exist for medicinal plants. Firstly, a medicinal plant information databases is needed.

There are some approaches to medicinal plant conservation: Ecosystem-based approach, approach to production or *in situ* protection and commercial system approach. Conservation strategies need to be coordinated based on both of *in situ* and *ex situ* protections in Turkey.

The genus *Filago* (*Asteraceae*) in the North-West Africa

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The generic boundaries among *Filago* L. (*Asteraceae*) and related genera (e.g. *Evax* Gaertn. or *Logfia* Cass.) are difficult to establish due to the general scarcity of morphological characters traditionally considered relevant for classifying the group and the presence of some degree of homoplasy. In this situation *Filago* has been recircumscribed recently on the basis of sequence data from nuclear and plastid DNA, morphological characters and genome size. According to this new classification the genus is considered independent from *Logfia* and enlarged to include *Cymbolaena* Smoljan., *Evacidium* Pomel, *Evax* and *Filago arvensis* L. [*Logfia arvensis* (L.) Holub in many taxonomic treatments]. According to these results *Filago* comprises c. 40 species distributed in the Northern hemisphere, with NW–Africa (Morocco, Algeria and Tunisia) as a particularly species rich area with 26 species and a putative centre of diversity.

In this work we present the most comprehensive phylogenetic analysis of the genus published until now, as well as a taxonomic review for the genus in NW–Africa, based on sequence data of ITS and ETS (nuclear ribosomic DNA). Our sampling for the molecular analyses includes all except one [i.e., *F. mauritanica* (Pomel) Dobignard] species from the area, particularly two endemic to NW Africa [i.e. *Filago longilanata* (Maire & Wilczek) Greuter and *Filago prolifera* Pomel], which have never been included in previous DNA sequence based phylogenetic studies. An identification key for the 26 species growing in the study area is provided here for the first time, together with a nomenclatural review that includes the synonyms used in the most outstanding floras and checklists for NW–Africa. Finally, after an exhaustive review of more than 2200 sheets lodged in 25 herbaria a chorological summary is presented.

The flora of Tunceli (C. E. Turkey) and its importance

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Tunceli is like an island surrounded by Keban Dam, Pülümür River and the branches of Euphrates River. This island consists of mountains ranging from 1500 m to 3000 m watering by different small and large streams. The reasons behind the protection of natural life in those areas are twofold: areas consisting of mountains and deep valleys, and rare human population. This province can be considered as a haven for wildlife and plants. Almost all parts of Tunceli are within The Important Plant Areas. There are six glacial lakes in the province. Tunceli consists of 75% mountains, 25% plateaus and 5% plains. Moreover, Munzur Valley National Park is one of the Turkey's largest national parks and was declared as a national park since 1971.

The northern parts of Tunceli, located in Irano-Turanian region, include forests containing different oaks. The mountain steppe and rocky areas are above of forest zone. In the southern parts of Tunceli, the cultivated fields and the steppe formation are dominant because of human effects.

Till today, only one floristic research has been carried out in Tunceli where resembles like a closed box. Munzur Mountains, between Tunceli and Erzincan, have 18% endemism. Many floristic excursions have been carried out in Tunceli between 2014 and 2015 years with the support of Republic of Turkey Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks. According to the early results of this ongoing study, Tunceli province has 18% endemism, too. Additionally, two species (*Teucrium leucophyllum* and *Silene surculosa*) which were reported as Extinct (EX) by The Red Data Book of Turkey were discovered again in nature. Moreover, new taxa has also been discovered for scientific world.

In the near future, the dams which are planned to be constructed on Munzur and Pülümür rivers and the mining works may destroy the last castle of nature life. Therefore, monitoring and protection on species and regional levels are proposed according to the results of current research. Especially, the threatened species are preferred. The habitats reserving many endemic taxa are also evaluated under regional monitoring and protection. The works including conservation of those plants are planned to be started in the next few years.

Assessment and mapping of sparsely vegetated land ecosystems condition and their services in Bulgaria

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Sparsely vegetated land ecosystems are places where vegetation is lacking or very scarce. According to the ecosystem classification of MAES they include coastal dunes and sandy shores; coastal shingle; costal rock cliffs, ledges and shores, including the supralittoral; screes; inland cliffs, rock pavements and outcrops. Although these ecosystems occupy a relatively small area of the territory of Bulgaria, they have a very important role in protecting of particular species of the flora and fauna of the country, and in providing valuable services to people. The need to study and assess the condition of ecosystems and their services is outlined in a number of strategic documents, such as Action 5 of Target 2 *Maintain and restore ecosystems and their services of the EU Biodiversity strategy to 2020*. In Bulgaria nine types of ecosystems are present and mapping and assessment of their state and services already started in 2015 in is still ongoing. For assessment of ecosystems and their services a set of relevant indicators is used as part of a special methodology developed during the predefined project BG03.PDP2 *Methodological support*. These indicators provide information about the area of the respective ecosystem type, richness of the taxonomic groups presented, threats to the actual and potential ecosystem services. At the same time, they reflect changes in ecosystem state and services over time. The implementation of the activities began with collection of relevant information and GIS-modelling of the distribution of sparsely vegetated land ecosystems in Bulgaria, followed by verification of these models in the field, mapping and assessment of ecosystem condition and services. The main outcome of the project is the preparation of several map and GIS layers on the state of ecosystems with sparse vegetation in Bulgaria and their services.

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Karyomorphometric analysis of *Fritillaria montana* group (*Liliaceae*) in Greece

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Fritillaria L. (*Liliaceae*) is a genus of geophytes, represented in Greece by 29 taxa (species and subspecies) and divided into six groups following karyological and morphological characters, as well as biogeographical data. Most of the Greek *Fritillaria* taxa are endemic, while a significant number is threatened according to IUCN criteria. Although their classical cytotaxonomic study has already been presented, no karyomorphometric analysis has ever been given. In the present study, the cytological results of *Fritillaria montana* group, which includes the endemic *F. epirotica* Turrill ex Rix with $2n = 2x = 24$ chromosomes and *F. montana* Hoppe with $2n = 2x = 18$ & $2n = 3x = 27$ chromosomes, are further examined with several chromosomal indices. Except from the karyotype analysis, for each taxon the maximum and minimum length of the chromosomes, as well as the total and average chromosome length are given. Moreover, the interchromosomal (CVCL) and intrachromosomal asymmetry (MCA) are estimated. When marker chromosomes are observed, r-index, R-length, centromeric index and arm difference ratio are also given. A new population of *F. epirotica* is investigated, while in the triploid population of *F. montana* from Mt. Boutsi (NW Greece), whose karyotype analysis is here presented, a diploid individual is also found.

Ethnobotanical study of wild edible plants in rural communities of Lebanon

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Wild edible plants gathering is widely practiced cultural tradition and is known to make an integral component of the food baskets and livelihoods in the rural regions of Lebanon. Nevertheless, due to excessive commercial gathering and habitat destruction, most wild edible plants are presently threatened and their associated traditional knowledge may be lost in a few decades if not urgently documented. In a recent study focusing on traditional Lebanese plant-based food recipes, the nutritional value of ten most common recipes was revealed to offer a healthier alternative to processed dishes recently introduced to Lebanese diet. This has evidently shown that wild edible plants can contribute to improved nutrition against the health adverse effects of nutrition transition and maintenance of household food security in Lebanese rural communities. Thus, there is a need draw an inventory of all common Lebanese wild edible plants and document associated traditional knowledge in order to expand our knowledge and further promote the importance of these plants as a potential source for community resilience and food security.

This study presents the findings of an on-going ethnobotanical survey of wild plants commonly consumed by the rural Lebanese communities in 15 villages and towns in the regions of Anti-Lebanon mountain range, Bekaa, North and South Lebanon. Through semi-structured interviews with 136 informants, information was collected during 2011-2015.

A list of 70 plant species and relevant traditional knowledge on plant parts, mode of consumption and other ethnobotanical uses is presented. Of the different food categories considered, green leafy herbs formed the largest group, followed by plants used for wild fruits, seasoning, beverages and preservatives. According to the frequency of use reports, *Malva sylvestris* L., *M. neglecta* Wallr., *Cichorium intybus* L., *Ci. pumilum* Jacq., *Origanum syriacum* L., *Eryngium creticum* Lam., *Portulaca oleracea* L., *Gundelia tournefortii* L., *Asparagus acutifolius* L., *Nasturtium officinale* R. Br., *Rumex patientia* L., *R. acetosa* L., *Lactuca saligna* L., *Trigonella foenum-graecum* L., *Ceratonia silqua* L., *Nigella sativa* L., *Allium ampeloprasum* L., *Malus trilobata* (Poir.) C. K. Schneid., *Pyrus syriaca* Boiss., *Amygdalus communis* L., *Prunus mahaleb* L., *Rhus coriaria* L. among others had the highest values. The findings indicate the richness of wild edible plants and their potential to build community resilience towards food security. The promotion of biodiversity conservation and sustainable use in concert with more mainstream agricultural innovation while minimizing threats to this valuable plant resource are recommended.

Analyses of divergence within *Arenaria provincialis* (*Caryophyllaceae*) beyond history and phylogeography

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A phylogeographic structure associated to an environmental gradient is expected to be a promising pattern for emergence of Evolutionary Significant Units (ESUs). Application of this theory led phylogeography to be an important method to design conservation unit and priorities at the intraspecific level. The narrow endemic plant *Arenaria provincialis* (*Caryophyllaceae*) is a suitable model to test this theory. Indeed, chloroplastic DNA lineages are very diverse within this species and well organized geographically despite its small distribution area. Here we compare different measures of evolutionary and ecological divergence within *A. provincialis* : DNA sequence divergence, mRNA sequence divergence, DNA multilocus markers differentiation, morphometric and ecological distances. Field and molecular data are supporting that *A. provincialis* populations are persisting since a very long time and that despite a strong phylogeographical structure the species remains a cohesive entity.

The Azorean Biodiversity Portal -PORBIOTA, a key e-infrastructure for the integrated management of bryophyte species in Azores

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The Azorean Biodiversity Portal (ABP) and the ATLANTIS database are key e-infrastructures for the integrated management of terrestrial and marine biodiversity data of the Azores, providing a large number of specialized services supporting research, policy and education. Bryophytes are one of the best mapped taxon in this E-Infrastructure. The major goal of the ABP is to compile and integrate dispersed information for all species that occur in the Azores, and to make it easier to gather new biodiversity data, organize, manage and analyze it. Furthermore, within PORTBIOTA the ABP will be set up as a dynamic structure where users' needs guide the development of new desirable products and services, namely Ecosystem Services assessment and mapping using macro-ecological approaches. Other goals are: a) to format the ABP database according to the Darwin Core Standard allowing data interchangeability with GBIF and other biodiversity databases; b) to create a new interface that allows users to select, combine, query, view and download species data (e.g. distribution); c) to add new complex analytical tools (e.g. Predicting realized species distributions, SDMs) which will significantly enhance its usefulness; d) to help answering to the societal goals, such as the European Directives (e.g. Birds, Habitats, Water, Marine Strategy), National Strategies (e.g. Sea) and the general sustainable use of the environment; e) to contribute to raise biodiversity awareness and increase public understanding of science through citizen science and other outreach programs.

This was the first Biodiversity Portal in Portugal, starting in 2008, and the only one which provides easy access to island biodiversity data. ABP is currently recognized as a valuable outreach, management and conservation tool for all who work in science and protection of biodiversity.

DCDB: an updated on-line database of chromosome numbers of tribe *Delphinieae* (*Ranunculaceae*)

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A new version of the earlier chromosome database of tribe *Delphinieae* (Simon, J., M. Bosch, J. Molero & C. Blanché 1999, A conspect of chromosome numbers in tribe *Delphinieae* (*Ranunculaceae*). *Biodiversity Electronic Publications, 1* [on line]. [Available at http://hdl.handle.net/2445/95875]) is presented, after an accurate extensive literature and internet survey, by adding the chromosome counts for the genera *Aconitum* L. (including *Gymnaconitum* (Stapf) Wei Wang & Z. D. Chen), *Delphinium* L. (including *Staphisagria* Spach), *Consolida* (DC.) S. F. Gray and *Aconitella* Spach., accumulated in the last 17 years.

A total number of 2298 reports is presented, belonging to 388 species, representing about 44 % of the total species number of the tribe (an increase of c. 120% if compared with the 1097 reports captured in the 1999 version). This increase is due both to chromosome research extension (analyzed as counts/year) and an improved information capture system (including checking of populations location through Cyrillic, Japanese and Chinese alphabets). Additionally, recent taxonomic advances, synonimization and new phylogenetic criteria have also been taken in account.

The main basic number $x = 8$ is found at $2x$, $3x$, $4x$, $5x$, $6x$, and $8x$ ploidy levels, whereas $x = 9$ is much rarer. Polyploidy is more frequent in perennial taxa (*Aconitum* and *Delphinium s. str.*) whereas in annuals disploidy (both increasing and decreasing) takes more importance and should be considered as source of new evolutionary opportunities. The most frequent counts are $2n = 16$ and 32 but counts of $2n = 12$, 14, 17, 18, 20, 24, 26, 28, 30, 34, 40, 46, 48, 52, 64 have also been recorded. In 19 species more than one different chromosome number has been reported and 76 species showed different ploidy levels.

The *Delphinieae* Chromosome Database (DCDB) provides the most complete current available information on chromosome numbers of *Delphinieae,* yearly actualized and easily available by a system searchable through international platforms as CCDB, to be useful for general building of cytotaxonomical databases and for specific research ongoing projects of systematics of *Ranunculaceae*. It is based in MsAccess/MsExcel software, and includes 3-levels of taxonomic resolution (published name, database accepted name and PlantList Standard name), and geographic origin of each count (country, and population when provided in the original source).

Simon, J., Bosch, M., Molero, J. & Blanché, C. 1999: A conspect of chromosome numbers in tribe *Delphinieae* (*Ranunculaceae*). Biodiv. Electronic Publ. **1** [on line] http://hdl.handle.net/2445/95875

Biodiversité des lichens corticoles de différents phorophytes de la région d'El Kala (Nord-Est algérien)

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L'étude menée dans la région d'El Kala relative à la flore lichénique corticole de cinq phorophytes: chêne-kermès, chêne-liège, chêne-zeen, olivier, et frêne s'est révélée fructueuse. Du point de vue systématique, avec 30 familles englobant 175 espèces répertoriées, nous pouvons dire que la région présente une diversité lichénique certaine en comparaison avec celle des autres pays méditerranéens. 149 taxa ont été recensés sur *Quercus suber*, 118 sur *Quercus canariensis*, 91 sur *Fraxinus angustifolia*, 83 sur *Olea europaea* et 52 sur *Quercus coccifera*. L'importance du nombre de taxa lichéniques est essentiellement au niveau de la famille des *Parmeliaceae* représentée principalement par le genre *Parmelia* et de la famille des *Physciaceae* représentée par les genres *Physcia* et *Physconia* reconnus par leur espèces nitrophiles. Du point de vue physionomique, ce sont les taxa à thalles crustacés qui dominent la flore lichénique des phorophytes étudiés avec 91 espèces suivi des foliacés avec 48 espèces. Sur le plan sociologique, 9 groupements ont été identifiés au niveau de la région d'El Kala; *Quercus suber* abrite à lui seul 5 associations lichéniques suivi de *Quercus canariensis* avec 4 associations, *Olea europaea* et *Fraxinus angustifolia* avec 2 associations chacune et *Quercus coccifera* avec 1 association. Une analyse lichénogéographique est abordée. Les chorotypes dominants de la flore lichénique de la région d'El Kala sont les tempérés et les subocéaniques avec respectivement 47% et 41%. La composante "rare" atteint 9% de toute la flore lichénique, montrant ainsi, son grand intérêt pour la biodiversité.

Karyomorphological study of the populations belonging to *Psephellus aucherianus* complex (*Asteraceae*)

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The chromosome numbers and karyotypes belonging to populations of *Psephellus aucherianus* complex were discussed in this paper. The chromosome numbers of all populations were determined as $2n = 30$. Karyomorphological results indicated that the populations of *Ps. aucherianus* complex are differentiated from each other in some aspects. Mainly, the karyotype formulas could be evaluated as very specific for populations of each taxa. Otherwise, the chromosomal indices revealed that the investigated populations had largely symmetrical karyotypes and low chromosomal heterogenity as a common chromosomal pattern. As a general result, we determined that both the species (*Ps. aucherianus* and *Ps. sintenisii*) and their populations could be characterized by assisting karyomorphologic features. As a conclusion, although the species of the complex discussed here have significantly common chromosomal pattern, we think that the populations of *Ps. sintenisii* are more differentiated than others due to its edaphic isolation.

Un nouveau jardin botanique à Sassari (Italie)

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Les Jardins Botaniques se trouvent dans la plupart des villes universitaires où ils exercent des fonctions éducatives, scientifiques et plus généralement culturelles, constituant également un espace vert attractif pour les populations locales et pour les visiteurs occasionnels de la ville.

A Sassari, le toponyme "*sa Botanica*" rappelle l'ancienne présence d'un jardin, mais actuellement, la ville en est dépourvue car il a été sacrifié à l'expansion urbaine. Le projet qui est sur le point d'être réalisé va combler cette lacune et il s'insère dans le plus large contexte de "Sassari Ville Universitaire".

Le Jardin Botanique de l'Université de Sassari vise à introduire dans une zone de pertinence du siège universitaire, les espèces végétales de la Sardaigne, les habitats les plus caractéristiques; à soigner et conserver les espèces en danger d'extinction ou menacés; à identifier des stratégies efficaces de protection; à conduire des recherches sur le terrain et en laboratoire afin d'accroître les connaissances botaniques et promouvoir la conscience collective de la protection de la flore indigène et de la nature. En particulier, on préconise la création d'un réseau de microsites d'intérêt qui mettent en évidence les spécificités de la flore locale encadrées dans le système régional de conservation de la biodiversité et agissant ainsi comme une "Porte Botanique" pour la Sardaigne comme une sorte de *hotspot* qui introduit aux habitats de la même région.

Le début du processus de création du nouveau Jardin Botanique de Sassari remonte à plus de 10 ans mais seulement maintenant se sont concrétisées les conditions objectives pour mettre en œuvre sa réalisation dans un temps très court, en raison de la disponibilité des ressources nécessaires. Le groupe de travail mis en place par l'Université de Sassari en prévision de la création du Jardin des plantes a produit une série de documentations et de documents cartographiques qui constituent une base de référence importante pour la préparation du projet final confié à une société de conception. L'entrepreneur qui a gagné le marché a été épaulé, pour la préparation des documents de conception, par le délégué rectoral, I. Camarda et par un Comité scientifique international (E. Biondi, M. Costa, S. Oldfield, P. Pavone, F. M. Raimondo, M. Rejdali) et par les chargés de recherche L. Carta et A. Brunu.

The folk medicinal plants of Uşak (Turkey)

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This study was made to reveal the plants used as traditional folk medicine in Uşak situated in West of Turkey. The specimens of the plants used as folk remedies have been collected and the information about the local names, the part(s) used, the ailments treated, the therapeutic effect, the preparation, the methods of administration, and the duration of treatment has been recorded. The ethnopharmacological information was obtained from the local people by personal interviews carried out face to face. The plant specimens are kept in the Herbarium of the Faculty of Pharmacy, Marmara University. As a result of identification of the plant specimens, 38 species, used as a traditional folk medicine in Uşak, have been determined. According to the majority of the plants which have similar usage, the plants are mostly used for gastrointestinal system diseases, respiratory system diseases and urinary system diseases.

An ethnobotanical review on uses of the Turkish *Salvia* species (*Lamiaceae*)

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Salvia (*Lamiaceae*) is one of the most useful genera used especially for traditional therapy in Turkey. The aim of this study is to revise various ethnobotanical uses of *Salvia* species according to our investigations in scientific literature records. Our investigations are based on local ethnobotanical studies. The ethnobotanical information was obtained through open ended and semi-structured interviews from the local people. The specimens were collected during the field works and identified. In addition, the scientific literature records on the subject were revised.

According to the results, 36 *Salvia* taxa are ethnobotanically used in Turkey. The usages of the plants are as follows: traditional folk medicine (34 taxa), food (19 taxa), herbal tea (5 taxa), spice (2 taxa) and dye (1 taxa). Among them, *Salvia fruticosa, S. tomentosa,* and *S. virgata* are the most popular plants and they are used in many localities of Turkey.

Les plantes alimentaires de la Sardaigne: un patrimoine ethnobotanique et culturel d'ancienne origine

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Les plantes spontanées utilisées dans la tradition populaire, si l'on tient compte de leur usage largement répandu jusqu'à il y a quelques décennies, a bénéficié de l'attention particulière de nombreux auteurs. Une vaste synthèse sur les espèces d'importance alimentaire a été donnée par Atzei en 2003. Les premières enquêtes archéo-botaniques menées dans les sites archéologiques des Nuraghes *Toscono* et *Urpes* dans le centre de la Sardaigne, et dans les plus récentes fouilles à *Sa Osa*, ont révélé dans des couches attribuées à la période nuragique (1500 av. J.-C.) de nombreuses espèces de plantes soit ligneuses, soit herbacées. (*Castanea sativa, Prunus spinosa, Cucumis melo, Pistacia lentiscus, Vitis vinifera, Triticum durum, Rumex sp.,*). Cette période précède la première colonisation de l'île par les Phéniciens (900 a. JC), donc on peut supposer une introduction beaucoup plus ancienne de la vigne et du blé.

Certains noms des plantes (*zicchiria, curuma, zippiri*) sont d'origine phénico-punique et leur utilisation précède probablement aussi la conquête et la colonisation de l'île par les Romains (238 a. JC.).

Dans Pline, en dehors des références génériques, nous avons peu de citations (*Castanea sativa, Quercus coccifera*) ainsi que le célèbre *Risus sardonicus*, se référant aux effets d'une plante toxique (*Oenanthe crocata*) confondue vraisemblablement avec *Apium nodiflorum*. Dans les anciens *condaghes* médiévaux, une sorte de registres d'église des premiers siècles du second millénaire, sont nommées environ 100 plantes, certaines surtout cultivées (blé, orge, vigne, olivier), et d'autres appartenant à des espèces sauvages encore couramment utilisées aujourd'hui.

Les noms des plantes, dans une très large mesure, sont dérivés du latin (p. ex. *alinu=alnus, cardu=carduus, chercu=quercus, ficu=ficus, filighe=filix, ghiniperu=juniperus, ruvu=rubus, juncu=juncus*), mais il y a également des espèces désignées par des noms (*Mudecru=Cistus monspeliensis, Adanu=Genista aetnensis, Codoro=Pistacia terebinthus*) attribuables à l'ancienne langue des Sardes.

Les espèces sauvages qui ont un nom en langue sarde (souvent avec de nombreuses variantes locales) sont environ 1.000, et parmi celles-ci les plus communes sont celles d'intérêt alimentaire.

Les familles contenant le plus grand nombre d'espèces alimentaires connues et utilisées sont les *Asteraceae* (*Cynara, Carduus, Cichorium, Onopordon, Crepis, Reichardia, Hyoseris, Urospermum, Aetheorhiza*), les *Brassicaceae* (*Brassica, Raphanus, Diplotaxis, Eruca*), les *Apiaceae* (*Foeniculum, Apium, Daucus*), les *Phaseolaceae* (*Lotus, Lathyrus, Vicia*), les *Boraginaceae* (*Borago*), les *Polygonaceae* (*Rumex*). Les arbres et arbustes à fruits (tels que *Arbutus unedo, Celtis australis, Ficus carica* var. *caprificus, Juniperus sibirica*, *Myrtus communis, Olea oleaster, Pistacia lentiscus, Prunus spinosa, Quercus pubescens, Pyrus spinosa, Rubus ulmifolius*) sont recherchés pour être consommés directement ou transformés de plusieurs manières.

Les fougères, à l'exception du rhizome de *Polypodium australe*, n'ont pas d'intérêt alimentaire, alors que d'autres plantes ont des utilisations spécifiques comme la tige de *Ferula communis*, consommée à des fins apotropaïques, et la tige de *Conium maculatum*, les deux espèces étant connues comme toxiques.

Les nombreuses implications que présente l'utilisation des plantes alimentaires, allant de la phytogéographie à l'histoire, de l'ethnographie à la systématique, font l'un des principaux attraits culturels de leur étude.

Project for a Sicilian Bryophyte Red List

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Due to its location, Sicily has always represented an important biogeographic bridge between floras of temperate and tropical climates as well as between those of the western and eastern Mediterranean. Its central position in the Mediterranean was also key factor of a millenary history of human settlements which resulted in profound landscape changes in the past, but even at present human pressure continues to be very heavy. In spite of this, Sicily is part of one of the 10 most important hotspots in Mediterranean Basin, thanks to plant richness and endemism (Médail & Quézel 1999: Conserv. Biol. 13(6): 1510-1513).

The bryophyte flora, including ca. 600 taxa (almost half of Italian bryoflora), is, as well as vascular flora, very rich and likewise threatened. A first list of 182 endangered species of Sicily and small islands around it was compiled by Campisi & al. (2003: Intern. Sem. on Harmonization of Red Lists for threatened species, pp. 241-275), but a precise category of threat was not assigned to taxa. The establishment of a complete Red List is fundamental to bryophyte conservation in Sicily a fortiori because it is an Italian region with legislative and administrative autonomy in the field of environmental protection.

The project, here presented, has just been started with regard to liverworts and hornworts. It takes into account specific guidelines for bryophytes as well as the IUCN criteria. As to the latter, however, it was considered appropriate to adopt some changes to avoid an overestimate of endangered species, following a procedure similar to the one adopted by González-Mancebo & al. (2012: Biodivers. Conserv. 21: 3613-3636.) for the compilation of Red List of the Canary Islands. For assigning threat categories, therefore, we opted for scaling the thresholds set of the Extent of Occurrence (EOO) and of the location number. Besides a red list the project provides for the realization of atlas of top 50 bryophyte taxa for which sheets with description, general and Sicilian distribution, ecology, EOO and AOO, the main threats and status in Sicily will be reported. Some examples of sheets of rare liverworts in the island are illustrated.

Phylogenetic relationships between annual species of *Alyssum* (*Brassicaceae*): the origin of supposed allopolyploid *A. siculum*

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After the recent separation of the genera *Cuprella*, *Meniocus* and *Odontarrhena*, the genus *Alyssum* comprises about 114 species. Twenty seven of them are annual herbs, traditionally placed in two sections (*A.* sect. *Alyssum* and *A.* sect. *Psilonema*). The published molecular studies (based on ITS sequences) do not support the differentiation of the two sections. Most of the annuals (except *A. dasycarpum*) form a common phylogenetic clade with the perennial *Alyssum montanum-A. repens* complex. Remaining species of *Alyssum* form another clade containing mostly the perennials of *A.* sect. *Gamosepalum* and the annual *A. dasycarpum*. Additional molecular markers are needed to resolve the phylogenetic relationships within the genus. Native distribution of annual species of *Alyssum* is predominantly in Eurasia with the centre of diversity in southern Europe and SW Asia. Several annuals were introduced to other continents. Five ploidy levels were reported for the annual species, including diploids, tetraploids and rare triploids, hexaploids and octoploids. The base chromosome number is $x = 8$ (exceptionally $x = 7$ in *A. umbellatum*). In our planned studies, we are focusing on the origin of supposed allohexaploid *Alyssum siculum*, phylogenetic relationships of its potential parents and other of the 15 known European annual species of the genus *Alyssum*. Our preliminary field sampling and ploidy level screening covers 99 population samples of 9 species from Apennine, Balkan and Iberian Peninsulas, Central Europe and Morocco.

Phylogenetic relationships and taxonomy of Balkan taxa of the genus *Odontarrhena* (*Brassicaceae*)

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The recently resurrected genus *Odontarrhena* (*Brassicaceae*) encompasses 87 perennial herbaceous species, previously placed in the genus *Alyssum*. Their native distribution area includes Central and southern Europe, North Africa and temperate Asia (one species is native also in North America). They occupy xeric and rocky habitats across a large altitudinal span, including very specific environments such as serpentine rocks and coastal sandy dunes. The base chromosome number is $x = 8$ and four different cytotypes were reported in the genus - diploids, tetraploids, hexaploids and octoploids. The data on cytogeography of particular species are still very scarce. The genus includes many local endemics and few widespread species complexes with unclear morphological circumscriptions and controversial taxonomic treatments. The only molecular systematic study of *Odontarrhena* species has focused on Apenine and Iberian taxa. However, nothing is known about the genetic variation and evolutionary history of Balkan taxa of the genus. In our current studies, we are focusing on two species complexes, *Odontarrhena muralis* s. l. and *O. tortuosa* s. l. and their relationships to other European taxa of *Odontarrhena*. Our aim is to explore phylogenetic relationships of particular species, to reveal their evolutionary history, to explain the origin of polyploids, and to revise their traditional taxonomic concepts. Here we present our preliminary population samples and their ploidy levels estimated by flow cytometry.

An updated overview on distribution of *Reseda* (*Resedaceae*) in Turkey

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Resedaceae is only represented by the genus *Reseda* in Turkey. This genus encompasses approximately 65 species worldwide, some of which are widely distributed in the Mediterranean Basin. There are 23 indigenous taxa in Turkey and 10 of them are endemics. The western Mediterranean area and the eastern Mediterranean and southwest Asia region seem to be the major centers of differentiation and diversification of the family according to the number and abundance of the species and the endemism level. The species of the genus *Reseda* are annual or perennial herbs that can grow up in limestone soil and arid environments.

In this study, an updated overview of the distribution of the genus *Reseda* in Turkey is presented, and this work is based upon a collection of specimens from field trips carried out in 46 provinces between 2013 and 2015. In addition to morphological characters of the genus, ecological requirements and general information about rare species are discussed.

Ex-situ conservation of *Rhaponticoides mykalea* (*Asteraceae*) in Nezahat Gökyiğit Botanic Garden, Turkey

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In this study, phenological properties of the critically endangered (CR) *Rhaponticoides mykalea* (Hub.-Mor.) M.V. Agab. & Greuter, a narrow Turkish endemic species, known only from Samsun Dağ (Kuşadası, Aydın), Yatağan (Muğla) and Isparta are investigated. The aim is to determine the taxonomic status of *R. mykalea* by examining phenological properties and to help prospective plants conservation and plant breeding studies. This species had been described from specimens which were collected from Samsun Dağ. Its type locality is under heavy anthropogenic threat because it is situated in one of the most intensive touristic and urbanization area.

Aydın gaşağı was included in the plant conservation projects of Nezahat Gökyiğit Botanic Garden collections in 2007. For this purpose, we created an *ex situ* conservation facility in the Useful Plant Collection area of our garden. As part of the conservation project, which has been developing since 2008, phenological characterization was undertaken in the conservation area. In the phenological studies, measurements were taken of stem, leaf, capitulum, fruit and seed characteristics of 20 specimens. In order to compare these data, same phenological characterization will be done for the plants planted in Amasya according to their natural habitat.

Stem Anatomy of two bulbous *Poa* species (*Poaceae*) from the Mediterranean region of Turkey

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Poa is the only genus of grasses with true bulbs, all others with swollen culm bases actually have corms. There are many species having a bulbous habit in the genus. *Poa densa* Troitsky and *Poa bulbosa* are morphologically similar species and can be easily confused because of their common bulbous habits. They were earlier placed in *Poa* subg. *Ochlopoa* sect. *Arenariae*, in (*Poa bulbosa* complex) which the only section of the genus characterized by bulbous based shoots. So with this study, we aimed to put forward similarities and differences of the two closely related species on the basis of their stem anatomy features. Our preliminary results showed that diameter of culm cross section, sclerenchyma thickness and distribution, number, shape, length of vascular bundles showed differences between species and they can be good anatomic characters to delimitate the species in the genus. The findings of this study are obtained while revising the genus *Poa* in Turkey (TUBİTAK 212T113).

Genetic diversity is related to landscape diversity in *Funaria hygrometrica* (*Funariaceae*)

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In comparison with vascular plants, most bryophytes have wide distribution areas. The available data suggest that in most cases small spores are occasionally dispersed at even intercontinental distances. As a result, genetic differentiation between different populations is often low. In some cases bryophyte species occupy habitats under a high diversity of climatic conditions as specified e.g. by temperature or precipitations. The question arises whether bryophytes occupying such diverse habitats have a "generalist genotype" allowing them to survive under very contrasting ambient regimes or whether there is a hidden genetic component of "physiological races" adapted to certain types of habitats. In the first case one would expect that populations along an ecological gradient (e.g. altitude in mountain systems) are not differentiated and that there is no difference between the values of genetic diversity of populations from diverse landscapes and homogeneous landscapes of similar size. If "physiological races" exist, one would predict a genetic differentiation between populations along an altitudinal gradient and a higher genetic diversity in diverse habitats compared to uniform habitats. We tested these hypotheses in the case of *Funaria hygrometrica* in S Spain analyzing populations from Sierra Nevada Mountains and nearby areas. In this region subtropical and alpine climatic conditions (ranging from sea level up to 2500 m a.s.l.) at a distance of less than 50 km. The data from Sierra Nevada were compared with the results of populations from the Murcia region, collected from 5 up to 300 m a.s.l. This region shows a uniform precipitation regime under a semi arid Mediterranean climate. Nuclear, chloroplast and mitochondrial sequences show a higher genetic diversity in the Sierra Nevada Mountains than in Murcia region. The genetic diversity in Sierra Nevada is structured according to altitude and not to geographical distance. The samples from Murcia are more similar to the samples from the lower parts of Sierra Nevada Mountains than to the populations of the higher regions. Together, these results suggest the existence of "physiological races" adapted to specific ecological conditions within *F. hygrometrica*.

Cistus laurifolius subsp. *laurifolius* (*Cistaceae*) in Italy: preliminary data on population structure, reproductive fitness and seed dormancy

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One of the most interesting Italian woody taxa from a conservation point of view is *Cistus laurifolius* L. subsp. *laurifolius* (*Cistaceae*). Currently, in Italy this species occurs only in Tuscany, where it is distributed in five subpopulations near Florence. According to the IUCN categories, it has been recently evaluated as vulnerable (VU) at national level. Our aim was to estimate its population size, density and demographic structure in Italy, and to study the reproductive success for different densities (i. e. Allee effect) and for each subpopulation. Finally, we performed seed imbibition and germination tests at different conditions (no treatment, 60 °C for 1 hour, 100 °C for 10 minutes and scarification), in order to investigate seed dormancy.

Demographic results show that the Italian population of this species is composed by ca. 10.000 individuals with a mean density of 0.116 plants/m^2. The smallest subpopulation has currently just one adult plant left, so it could be considered as almost extinct, whereas the largest subpopulation contains more than 90% of all the Italian population. The subdivision of investigated plants into three stage-age classes highlighted that 2% of the individuals are juvenile plants, i.e. with no more than 6 leaves, most of the plants (86%) are adult and the rest (12%) belong to an intermediate developmental stage. Our results highlighted that plants placed in high-density plots produce a number of flowers, fruits and seeds significantly higher than plants growing in medium- and low-density plots. In addition, at subpopulation level, the largest one produces a significantly higher number of seeds per fruit than others. These preliminary results led us to hypothesize an Allee effect for the Italian population of this species, given that small or sparse subpopulations may suffer of fitness reduction.

Finally, preliminary results of tests performed on seeds show that the water uptake (up to 162% in seed mass) and the final germination (up to 94%) in scarified seeds are significantly higher than controls and other experimental groups. This confirms that seed coat of *C. laurifolius*, as recorded in literature for other congeneric species, has a central role in seed dormancy, which is essential for understanding the dynamics of germination and the reproductive ecology of the Italian population.

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Threatened rare endemic plants in the Cilicia Region (Cukurova, Southern Turkey), new records and conservation status

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The Cilicia Region is located within the Mediterranean phytogeographical region, South of the Anatolian Diagonal. The Anatolian Diagonal has been very important for plant diversification, which has one of the significant floristic features of Turkey. The area involved in the Mediterranean basin has a great plant diversity importance and is a world biodiversity hotspot. Flora of Cilicia Region consist of about 2700 taxa of which nearly 500 taxa are endemic, 46 of them threatened rare endemic taxa. In 2013-2016, during a field study of the project "Rare Flowers of Taurus Mountains" were collected and photographed some rare endemic plants. The threats of the rare plants were assessed. Voucher specimens were deposited in herbarium of Faculty of Pharmacy of Cukurova University. As a result of this study, some rare endemic plants were added as a new record to flora of Cilicia: *Allium turcicum* N. Özhatay & Cowley; *Crocus kartaldagensis* Kerndorff & Pashce; *Hyacinthella micrantha* (Boiss.) Chouard, *Muscari erdalii* N. Özhatay & S. Demirci.

A short description of the taxa is provided with some indications about distribution area, habitat types and threats.

Threatened Rare Endemic taxa: *Allium enginii* N. Özhatay & B. Mathew; *A. karamanoglui* Koyuncu & Kollmann; *Astragalus distinctissimus* Eig.; *Ballota saxatilis* subsp. *brachyodonta* (Boiss.) Davis & Doroszenko; *Centaurea lycopifolia* Boiss. & Kotschy.; *C. ptosimopappa* Hayek; *C. ptasimopappoides* Wagenitz; *Cicer floribundum* Fenzl; *Colchicum osmaniyensis* N. Özhatay & E. Kaya; *Consolida cruciata* (P. H. Davis & Hossain) P. H. Davis; *Cyclamen cilicicum* Boiss. & Heldr.; *C. pseud-ibericum* Hildebr.; *Draba haradjianii* Rech.; *Erodium cedrorum* subsp. *salmoneum* (Davis & Roberts) Davis; *Ferula coskunii* H. Duman & M. Sağıroğlu; *Fritillaria alfredae* subsp. *glaucoviridis* (Turril) Rix; *Galanthus cilicicus* Baker; *Heptaptera cilicica* (Boiss. & Bal.) Tutin; *Hypericum crenulatum* Boiss.; *Lamium garganicum* subsp. *nepetifolium* (Boiss.) R. Mill.; *Muscari mcbaethianum* K. Tan; *Ophyrs isaura* Renz & Taub.; *Phylomis amanica* Vierh.; *Phrangos turcica* A. Duran, M.Sağıroğlu & H. Duman; *Silene doganii* A. Duran & Y. Menemen; *Stachys cydni* Gemici & Leblebici; *Tamarix duzenlii* Çakan & Ziel.; *Teucrium antitauricum* Ekim; *Verbascum amanum* Boiss.; *V. chionophyllum* Hub.-Mor.; *V. inulifolium* Hub.-Mor.; *V. linearilobum* (Boiss.) Hub.-Mor.; *V. lyratifolium* Köchel; *V. obtusifolium* Hub.-Mor.; *V. orbicularifolium* Hub.-Mor.; *Verbascum pterocalycinum* var. *mutense* Hub.-Mor.

Morphological, cytogenetical and molecular evidences on the origin of *Narcissus italicus* (*Amaryllidaceae*)

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The influence of interspecific hybridization and polyploidy in the evolution of *Narcissus* (*Amaryllidaceae*) have been shown to play a pivotal role in the origin of several species in the genus. The hypothesis of the hybrid origin of *Narcissus italicus* Ker Gawl. from *N. papyraceus* Ker Gawl. and *N. tazetta* L. proposed by Arcangeli (1894) was investigated in plants of natural populations. Vegetative and flower morphological characters have been compared by multivariate analyses. A cytogenetic study of the three species has been performed by analyzing the karyotype morphology and by Genomic In Situ Hybridization (GISH) to elucidate the putative parental species of *N. italicus*. Additionally, we sequenced a nuclear (ITS) and two plastid (*trn*L-F and NADH) regions from natural populations to explore the hypothetical hybrid origin of *N. italicus*. We also sequenced these regions in several species of *Narcissus* to complete the matrices with the available sequences in Genbank. Bayesian, maximum likelihood and maximum parsimony searches were performed using, respectively, MrBayes, RAxML and Paup 4.0 software. The hybrid nature was supported by the presence of high pollen sterility in *N. italicus*. The most probable paternal and maternal donor species that could have originated the *N. italicus* hybrid are discussed on the basis of morphologic, cytogenetic and phylogenetic results.

To be flower in *Valerianella* (*Valerianaceae*)

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Valerianella is a medium-sized genus of *Valerianaceae,* with ca. 50 species. Its traditional sections are based on the morphology of the fructing calyx, but experimental studies on some species revealed genetically conditioned intraspecific fruit polymorphism. Therefore, for the classification of *Valerianella,* other characters are needed. Flowers of *Valerianella* consist of the very variable, sometimes indistinct calyx, an infundibular corolla with (4-)5 lobes, and 3 stamens. On the basis of morphology and anatomy of the flowers, the genus has been divided into seven informal groups. Flower development in *Valerianella vesicaria* is here presented by live photographs. The flower morphology of *V. chlorostephana, V. balansae,* and the Turkish endemics *V. glomerata* and *V. turcica* are studied by scanning electron microscopy for the first time.

The spontaneous vascular flora of the Palermo (Sicily) urban area

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The spontaneous flora of urban areas has been studied since the nineteenth century and today is more and more under investigation, making it possible to monitor the conditions of areas that have been heavily modified by man and that, at first glance, seem to conserve few natural qualities. However, even among ruderal and cosmopolitan taxa found in these environments, there are species of biogeographic interest that deserve to be studied due to their ability to reveal the natural processes that still occur even in the most urbanized environment as well as due to their notable capacity to adapt to environments that are quite different from their primary habitats.

This study regards the vascular flora spontaneously occurring within the urban area of the municipality of Palermo, from the city centre to the densely populated suburbs. The data, gathered from extensive field surveys, literature review and from herbaria records, were updated and incorporated into a comprehensive account. The inventory of Palermo's flora includes more than 1/3 of Sicily's flora, occurring in an area of about 50 Km^2. About 20% of the recorded taxa have a broad distribution and 15% are non-native to Italy. 3% of the recorded taxa is endemic to Sicily or to Sicily and S-Italy. This rate of endemism is lower than that occurring in natural areas, but still represents a contingent deserving of conservation. This overview of flora reveals a remarkable species diversity and exemplifies the main features of Palermo's flora, characterized by a rich ruderal component, prevalently composed of native species that are well-adapted to human disturbance, along with several non-native taxa or taxa of uncertain origin as well as several taxa of high-conservation value occurring in remnants of near-natural vegetation. On the flip side, we can also see the loss or decline of the taxa related to freshwater and maritime habitats, which are the first to be subjected to strong human modifications.

The great number of species is mainly due to the variety of biotopes existing in the study area, including: stonewalls, wasteland, roadsides, shores, archaeological sites, stream banks and riversides, etc., as well as the large Favorita Urban park located within the urban boundaries. The large set of data and the overview presented in this contribution represents a fundamental framework for future research and for the conservation of plant diversity in the Palermo urban area.

New additions to the exotic vascular flora of continental Portugal

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In this study, based on recent bibliography and field observations, 66 new taxa are added to the catalogue of the exotic naturalized or subspontaneous vascular flora of the continental Portugal. This alien flora includes now 733 taxa (species, subspecies, varieties and hybrids), an increase corresponding to almost 10% compared to the previous total number of 667 taxa, since our last assessment, published in 2012 (Almeida & Freitas 2012), and earlier surveys (Almeida 1999; Almeida & Freitas 2006).

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Taxonomic and phytogeographic novelties for the genus *Sorbus* (*Rosaceae*) in Turkey

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Sorbus L. (*Rosaceae*) is a taxonomically difficult genus including several unrecognized taxa in Turkey. Extensive botanical expeditons in the country have resulted in some taxonomic, nomenclatural and biogeographic novelties. Taxa have been examinated in terms of morphology, palynology, anatomy and molecular approaches. Among the accepted *Sorbus* taxa, namely *Sorbus luristanica* (Bornm.) Schön.-Tem., *Sorbus buschiana* Zinserl., *S.* × *latifolia* (Lam.) Pers. have been evaluated from the point of view of phytogeography and taxonomy. Although *Sorbus luristanica* is generally known as a native species, it is excluded from the list of the Turkish Flora because of misidentifed specimens. *Sorbus buschiana* and *S.* × *latifolia* represent new records for the flora and their taxonomic relationships are discussed.

A new record for the flora of Turkey: *Kitaibela vitifolia* (*Malvaceae*)

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In this study, an interesting plant species, *Kitaibela vitifolia* (*Malvaceae*), was recorded for the flora of Turkey. This species was known to be endemic to the Balkans: narrowly distributed only in the former Yugoslavia and Albania as native; in Hungary and Romania as alien. During the biodiversity project performed by us on the Amanus mountains in the Southern of Turkey, this species was surprisingly observed on the clearings of the pine forest in the narrow area. Than some specimens were collected from this area for herbarium samplings. After Literature and herbarium studies the specimens collected were identified as *Kitaibela vitifolia*. The Turkish material collected of this species was described and illustrated. Geographical distribution of the taxon is mapped, and the conservation status, according to the IUCN standards, is discussed.

Conservation of Jerusalem plants – a local approach

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Jerusalem is situated at the edge of the Mediterranean climatic region, and is consequently rich in native plant species. Over 1,000 species are found in the city and its environs, which include Mediterranean species, steppe species, and even desert ones. In previous decades urban development, afforestation and agriculture destroyed wild habitats and led to the disappearance of many plants. Some of these are endangered in the whole country and are included in the Red Data book of Israel, while others are only locally Endangered. In this context, there is an increasing importance for the Jerusalem Botanical Gardens to collect, study, cultivate and even re-introduce these endangered species.

The Jerusalem Botanical Gardens have been involved in plant conservation since the 1980s. Over 250 endangered species thrive in the gardens.

Seeds and other plant materials are used to increase populations, are distributed to other botanical gardens, and have been even introduced in natural and semi-natural sites. Beyond proper conservation, the gardens 200,000 annual visitors (90,000 of them children) are exposed to the endangered species, and are taught about the importance of plant conservation.

Our challenge is to explain the importance of plant diversity as a whole, as an ecological complex, beyond attractive or economically important species.

Conserving wild plants and habitats for people in the south and east Mediterranean (IPAMed project)

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The aim of the IPAMed project is to promote the value of Important Plant Areas (IPA) as a tool for biodiversity conservation of plants species and their habitats in the Mediterranean region. IUCN Centre for Mediterranean Cooperation, Plantlife, numerous in-country Mediterranean partner organizations and the IUCN/SSC Mediterranean Plant Specialist Group are working together to help and encourage the public, management authorities, local and national governments, experts and NGOs to conserve Mediterranean IPAs.

Knowledge of the conservation status and distribution of plant species and habitats in IPAs is developing across the Mediterranean; but central to the project is the implementation of positive conservation action at the site level to mitigate threats to plant diversity. Such improvements in knowledge and site based actions are taking place on pilot IPAs in Morocco, Algeria, Tunisia, Egypt, Palestine, Lebanon, Turkey, Macedonia (FYR) and Montenegro.

Examples of two different approaches to plant conservation in North Africa and the Balkans are provided to illustrate the preliminary results of the IPAMed project.

In Gouraya IPA (Algeria) knowledge has been improved for 12 target taxa (e.g. *Bupleurum plantagineum, Erysimum cheiri* subsp. *inexpectans, Hypochaeris saldensis, Silene sessionis, Erodium battandieranum, Pancratium foetidum* var. *saldense, Sanguisorba ancistroides* var. *battandieri, Sedum multiceps*) through field work done by expert botanists. This information has been used to identify and inform the conservation actions of a group of stakeholders including, local NGOs, Gouraya National Park managers, National and Regional authorities (conservation of forests of Béjaïa) and botanists all of whom will be involved in their implementation.

In Skadar Lake IPA (Montenegro) monitoring of 5 target species (*Trapa natans, Cymbalaria ebelii, Minuartia velenovskyi, Marsilea quadrifolia*) and 2 invasive species (*Amorpha fruticosa* and *Ambrosia artemiisifolia*) has been carried out by a network of volunteers. This network carries out actions against threats such as control of invasive species and raising awareness of the value of the IPA among university and school students.

The main aim of the project is to demonstrate what is possible across the Mediterranean region when management authorities and citizens are empowered to work together for plant conservation.

Inter-population and temporal variation of VOC emission from Mediterranean *Helichrysum* (*Asteraceae*)

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Mediterranean *Helichrysum* species are highly diverse with respect to both phenotype and metabolite profile.

Volatile organic compounds (VOCs) were recently recognized as valuable tools for studying *Helichrysum* systematics at population level. In seeking carry on the studies on the phytochemical typification for taxonomic purposes, we examined the diversity and temporal variation of volatile profiles in eight selected Mediterranean populations, included within the *H. italicum* complex, *H. litoreum* and *H. stoechas*. The goals of this study are: *(i)* to evaluate and compare the differences of volatile profiles across populations and collection time, and *(ii)* to characterize the intra-population variation over time.

After collection in the wild, plants were cultivated in standard growing conditions at the Florence Botanical Garden, to remove the effects due to the different ecological conditions of the collection sites. The emissions of VOCs from annual leafy shoots were analysed in May, July and September 2012, by means of headspace solid phase microextraction coupled with gas-chromatography and mass spectrometry (HS-SPME-GC/MS).

The VOC analysis revealed the production of overall 417 compounds, with terpenes being the dominant compound class, followed by esters and alcohols.

Statistical data processing, based on a Permutational Multivariate Analysis of Variance and on a subsequent Variance Partitioning Analysis on the relative quantitative data of VOCs, showed a great variability in the volatile profiles across populations (69%, $p<0.001$), with a weak contribution due to time (5%, $p<0.001$), whereas the additional variance explained by the interaction term between these two factors is 19% ($p<0.001$). The volatile profiles of each population were consistent over time, as indicated by the high correlation coefficients (*ca* 65%), with the exception of only one provenance.

In conclusion, VOC profiles as a whole varied considerably from one population to another, and over time. Conversely, the low diversity of time-to-time emission pattern within each population suggests that the volatile profiles exhibit phytochemical consistency, presumably due to the standardization of the plant growing conditions. These data further enhance the potentiality of VOCs as diacritical characters in discriminating among populations and in solving taxonomic problems.

Karyotypes of 16 *Taraxacum* (*Asteraceae*) species from Turkey

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The genus *Taraxacum* (*Asteraceae*) is represented by 57 taxa in Turkey, 18 of which are endemic. They are grouped into 12 sections (Sect. *Dioszegia*, Sect. *Erythrocarpa*, Sect. *Erythrosperma*, Sect. *Macrocornuta*, Sect. *Oligantha*, Sect. *Orientalia*, Sect. *Palustria*, Sect. *Piesis*, Sect. *Primigenia*, Sect. *Scariosa*, Sect. *Sonchidium*, Sect. *Taraxacum*).

In this study the chromosome numbers and karyotypes of 16 species have been identified. All studied specimens were collected from natural habitats in Marmara Region located in the NW of Turkey. The chromosomes numbers of the following 7 species have been determined for the first time: *T. aznavourii* 2n=24; *T. bithynicum* 2n=16; *T. caudatuliforme* 2n= 24; *T. gracilens* 2n= 24; *T. hyberniforme* 2n= 32; *T. pseudobrachyglossum* 2n=24; *T. xanthiense* 2n=24. The basic chromosomes number is found as x=8. Only *T. bithynicum* is diploid, others are polyploid (triploid or tetraploid). The detailed karyological features of 16 *Taraxacum* species will be presented.

Can we agree on the defining features that make an *Inula* be an *Inula*? – Phylogenetic relationships among European species of *Inula* (*Asteraceae*)

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The genus *Inula* L. (*Asteraceae* tribe *Inuleae* Cass.), as traditionally defined, includes ca. 100 species distributed across Europe, Asia and Africa. Currently *Inula* is placed within the "Inula-complex", one of the three evolutionary lineages within subtribe *Inulinae*. Several authors have concluded than *Inula,* thus defined, is paraphyletic. It has also been shown that *Inula helenium* L. (a well-known species, which provides the type of the generic name) together with its sister species, is phylogenetically closer to other genera (e.g., *Carpesium* L. and *Telekia* Baumg.) than to the remainder of *Inula*. Here we present the first phylogenetic analysis that includes all European species of *Inula* (16), plus 25 additional species representative of *Inula* and related genera of *Inuleae* from Africa and Asia. Three hundred newly generated DNA sequences corresponding to the ITS region (nDNA) and to three cpDNA spacer regions have been used to (1) elucidate the phylogenetic relationships among these species and (2) investigate the phylogenetic position of *I.* sect. *Inula*. Also the main morphological characters traditionally considered to be useful for the taxonomy of the genus (e.g., carpological features) as well as data on base chromosome numbers have been reviewed. The careful evaluation of DNA sequence data, together with morphological features and karyological information suggests the independence of *I.* sect. *Inula* and its recognition at the genus level. Due to a recent recommendation by the Nomenclature Committee for Vascular Plants, the name *Inula* must continue to be applied to the genus that includes *Inula helenium*. By consequence, 24 new combinations are necessary to designate the remaining *Inula* species.

Shouf Biosphere Reserve in Lebanon: valuing ecosystem services and applying restoration actions for enhancing ecosystem conservation

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The Shouf Biosphere Reserve (SBR) covers an area of approximately 50,000 hectares, representing 5% of the overall area of Lebanon, which makes it one of the largest mountain protected areas in the Middle East. The SBR boasts with different terrestrial and freshwater ecosystems along its altitudinal gradient, including 620 hectares of *Cedrus libani* forests, the largest expanse of this species in Lebanon and 25% of the remaining cedar forests in the country, and is known for its high biodiversity comprising a wide range of natural habitats, flora and fauna species. Moreover, the SBR is home to: 25 internationally and nationally threatened flowering plant species; 48 plant species endemic to Lebanon or the Syria/ Lebanon/Turkey area; 14 rare plant species; and 214 plant species that are restricted to the Eastern Mediterranean or Middle East area.

A first attempt to assess the economic value of the ecosystem services in the SBR was conducted focusing on provisioning services such as fuel, water and food, regulating services such as carbon sequestration and water purification, and cultural services, such as tourism, recreation and education.

In a second phase an ecological restoration was applied through different interventions that covered an altitudinal landscape corridor connecting the Beqaa Valley and the Ammiq wetland in the east to the western slopes of the SBR mountains. Pilot interventions entailed the design, testing and implementation of ecological restoration, forest management and habitat protection techniques with a climate change adaptation approach.

The restoration actions included the production and planting of a wide range of about 35 native plant species – trees, shrubs and herbs - with a multi-purpose ecological, social and economic value. The average survival rate is of 79% to date, with no irrigation support. This success was mainly due to the production of high quality plant material from the selected species, a good preparation of the soil and careful planting of seedlings to facilitate the growth of the root system, and the selection of the right planting period. Our preliminary results showed that the economic benefits generated by the assessed ecosystem services in the SBR every year are in the range of 16.7 to 21.3 million US dollars. Ecosystems restoration is certainly a key strategy towards the conservation and sustainable management of the Shouf Biosphere Reserve.

Synopsis of lichens knowledge in Piedmont (North-Western Italy)

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Piedmont is the second largest region in Italy (25.400 km^2), surrounded by the vast arc of the Ligurian Apennines and the Maritime, Cottian, Graian, and Pennine Alps. It comprises the beginning of Po River valley, Italy's widest and most fertile plain. Approximately the 43% of the Piedmont is mountainous, along with vast areas of hills (30%) and plains (25%).

This study illustrates the analysis of data collected to compile a checklist of the lichens in Piedmont region. It rests upon data collected from literature, herbarium materials and field observations.

We gathered data from 207 scientific papers and from more than 7000 *exsiccata* and field observations (mainly carried out during applicative studies such as biomonitoring surveys). More than 13000 records have been analyzed as a whole.

The biggest set of lichen exsiccata collected in Piedmont (about 4000 specimens out of 29800) is kept in the *Herbarium Universitatis Taurinensis* (TO). Other big set of data come from the herbarium of the Università degli Studi di Trieste (TSB - 1604 records) and Gresino herbarium (1103 records). Literature data include the time period from 1770 to 2015 and comprise both lichenological (taxonomic, floristic and applicative) and phanerogamic studies.

Floristic studies of the lichens of Piedmont were started in the second half of the 18th century. The earliest paper in which lichen species from Piedmont were listed was a handwritten text by Caccia in 1740. Antonio Carestia (1825-1908) provided the most relevant contribution to lichenological knowledge of Piedmont. He worked in Sesia Valley, which is at present the only site worthy of conservation for lichens in Piedmont, nominated as "Important Plant Areas" by the Italian Ministry for the Environment. The known lichen flora of Piedmont consists of 1286 *taxa*.

Even if Piedmont is among the lichenologically best known regions of Italy and despite the long temporal continuity of lichen studies, many areas are largely unexplored. The Maritime Alps, the Appennines and the Po-Plain are the less investigated areas; whereas the alpine areas are moderately well explored.

Moreover, data on the occurrence and distribution of many species are still missing: for more than half of known species, less than 3 records are available. Data gathered here will ensure the planning of well distributed data collections in the future and the setting of focused biodiversity protection programs.

Contribution à la connaissance d'*Inula viscosa* (*Asteraceae*) : approche cytogenetique

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Inula viscosa est une espèce de la famille des Astéracées. C'est une plante vivace à tige frutescente pouvant atteindre 100 cm, et à feuilles visqueuses à odeur forte. Cette espèce occupe une aire de plus en plus importante dans la région d'Oran, en raison de la dissémination de ses akènes et de leur capacité à germer. *Inula viscosa* est connue sur le plan ethnobotanique pour ses multiples usages (cicatrisante, anti rhumatismale. anti-inflammatoire vermifuge, diurétique anti diabétique etc).

L'étude entreprise concerne le dénombrement chromosomique des cellules somatiques et la mise en évidence des organisateurs nucléolaires (NOR's).

Les apex sont prélevés sur des racines d'akènes au 6 eme jours de germination puis pré traités par 8-hydroxyquinoleine pendant 3 h.et fixés dans le mélange alcool absolu ,acide acétique (9v :1v) pendant 24h .Cette étape est suivie d'une hydrolyse pendant 3mn dans HCl N. Les apex sont colorés à l'orcéine acétique avant d'être observés au microscope. Les NORs sont mis en évidence par la méthode de Hall & Parker (1995) ; pour cela les jeunes racines sont placées dans le Nitrate d'Argent à 2% pendant 16h à 60°C puis la révélation est réalisée dans le mélange hydroquinone 1% -formaldéhyde 10% (v :v)

Les premiers résultats ont permis de dénombrer 18 chromosomes chez cette espèce et en moyenne 3 nucléoles.

Hall, K. J. & Parker, J . S. 1995: Stable chromosome fission associated with rDNA mobility .– Chromosome Res. **3:** 417-422.

Floristic composition and distribution patterns of the riparian plants communities from an Algerian watershed; Seybouse watershed

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Riparian zones hold a surprising diversified array of species and environmental processes. The ecological diversity is linked to many factors like the altitudinal climate variation and upland influences on the fluvial corridor. The ensuing dynamic environment maintains a variety of life-history strategies, biogeochemical cycles and rates, and organisms adapted to disturbance regimes beyond a wide spatial and temporal scales. The importance of riparian zones to aquatic ecosystems is generally well recognized, although no particular attention has been accorded to these ecosystems in North Africa. In this study, I conducted a survey during 2013-2015 of the riparian flora based on 228 samples from 36 sites located in a large watershed (Seybouse) in the Northeast of Algeria, and analyzed the relationship of the flora composition and distribution with 15 abiotic factors. In total 72 macrophyte taxa were recorded from 35 family and 62 genera, of which 10 were identified to the subspecies level and 69 to the species level. Of the 72 taxa sampled 58 are native while 14 are introduced species (7 listed as invasive species). Among all the taxa sampled three (*Cyperus longus* L. subsp. *longus, Epilobium hirsutum* L. and *Rumex palustris* Sm.) have a particular conservation status at the national level (protected by a national executive decree n° 12-03). In absence of any previous ample studies of the Seybouse watershed vegetation, an important initial question was: to what extent this survey reached a reasonable proportion of the riverine flora of the Seybouse watershed? I am confident that not many species remain to be found, since the chronological cumulative species records curve for our samples reached a plateau. Floral diversity and structure were evaluated using diversity indices such as Shannon index, Evenness and species richness. Canonical correspondence analysis (CCA) were used to ordinate Seybouse watershed macrophytes abundances and diversity with environmental variables. In conclusion, the flora of the Seybouse watershed is quite diverse and needs an urgent conservation plan because of the intense pollution and overgrazing; these factors might reduce local floral diversity and alter the functioning of the riparian ecosystem.

Taxonomic remarks on the Turkish *Sternbergia* (*Amaryllidaceae*)

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Anatomy of leaf cross sections, karyological studies, and nuclear DNA content analysis by flow cytometry were carried out on the six *Sternbergia* Waldst. & Kit. species from Turkey: *S. candida* B. Mathew & T. Baytop (endemic)*, S. clusiana* (Ker Gawl.) Spreng.*, S. colchiciflora* Waldst. & Kit.*, S. lutea* (L.) Spreng.*, S. sicula* Guss. and *S. vernalis* (Mill.) Gorer & J. H. Harvey. Concerning the karyological analysis, the number and morphology of the somatic chromosomes, the ploidy level and karyotype formula of the specimens used in the study were investigated. Measurements of somatic chromosomes were calculated with the formula of the relative variation in chromosome lenght (CV_{CL}) and the mean centromeric asymmetry (M_{CA}). We found two different basic chromosome numbers, *ie*. x = 10 (*S. candida, S. clusiana, S. colchiciflora* and *S. vernalis*) and x = 11 (*S. lutea* and *S. sicula*). The results of karyotype analysis corroborated the results of previous studies. The smallest chromosome length was measured as 3.05 μm in *S. clusiana* while the longest length of 20.89 μm was observed in *S. sicula*. This is the first study reporting nuclear DNA content results for *Sternbergia*. There is a great variation within the genus in the interspecific level since the 2C DNA content varies between 54.03 and 80.42 pg among the species investigated. Anatomical features of the leaves were good taxonomic markers, especially concerning their palisade cells, ribs, cuticle, laticifer canals, vascular bundles, crystals, stomatal index, and stomata structure. In conclusion, cytological characteristics of the *Sternbergia* species together with their leaf features proved to be quite useful in identification and therefore can provide more clarity for taxonomic revision of the genus.

L'arganier (*Argania spinosa*, *Sapotaceae*) : dynamique et enjeux de développement durable

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Parmi les essences forestières endémiques du Maroc, l'arganier (*Argania spinosa* (L.) Skeels, *Sapotaceae*) est un arbre clé-de-voute d'un écosystème complexe et multifonctionnel, l'arganeraie. Celle-ci présente divers atouts en rapport avec sa grande diversité biologique et le support offert pour l'agriculture. Néanmoins, l'arganeraie connaît des formes d'exploitation à l'origine de l'émergence d'enjeux et d'intérêts conflictuels.

Dans la région du sud-ouest marocain, l'arganier constitue le pivot de l'économie villageoise et ce depuis des temps immémoriaux. Cette espèce forestière et fruitière a remarquablement joué ce rôle et continue de le jouer, en assurant de multiples revenus aux populations locales. Ces revenus sont issus de différents services et produits que procure l'arganeraie, tels que le bois de feu, les noix d'argan, le pâturage, les cultures en sous-étage, etc. De ce fait, l'arganier constitue l'ossature de la vie socio-économique villageoise de cette région du sud-ouest marocain.

Mais l'utilisation de cette essence se traduit par des dégradations qui résultent de l'action humaine, à travers les défrichements, le surpâturage, le prélèvement de bois de feu, combinés aux stress écologiques dus aux sécheresses récurrentes, et aux attaques parasitaires. Le sauvetage de cet écosystème unique est devenu une priorité absolue en vue d'assurer le développement durable de toute cette région.

Toward a database about plant translocations designed to both research and stakeholders

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A conservation translocation aims at reinforcing or creating populations of a species by moving individuals, to improve the conservation status of the species at a local or the global scale. Although they can be considered as last-resort actions in conservation, translocations are being used more and more frequently in the current context of increasing human pressures on natural habitats and strong biodiversity erosion. Not only are they used by conservationists willing to protect species, but also by developers compelled to apply legal provisions regulating development projects and their impacts on nature. Yet, despite the existence of many past translocations, few data are available on these translocations. Many of them were not documented in peer-reviewed scientific articles scientific literature, and the grey literature reporting them is very scattered.

The TranslocPlant Database collects data about plant translocations in the Euro-Mediterranean region. Our goal is to identify thanks to the analysis of the database: (i) the trigger components of the translocations (original motivation), (ii) the project methodologies (geographical position, stage in the life cycle and number of individuals translocated, post-translocation management and monitoring), and (iii) the results of the translocations.

As a first step, the database has been built from a literature review on the methodologies of published translocations. We plan to complete it by translocations described in grey literature. It should, over time, be enriched by an international network of researchers and of wildlife managers. The database should help to build a common ground of feedbacks on prior operations in order to define the influence of transfer conditions and of environmental factors on translocation results, and to define optimal conditions of shared protocols. It would be also a way to establish that certain species cannot be translocated because of their ecological traits.

We offer here to describe the approach that led to the creation of this database, its structure and its key issues: how to have the database available for translocation operators and enriched by them (engineering office, NGOs, researchers, wildlife managers, etc.). These actors are indeed a long way from having information derived from past experiments even though they request it, which might reduce the effectiveness of the operations they lead. The TranslocPlant Database will help building a common experience about translocation and thus improve the success of such future operation of conservation.

Cytological and phylogenetic study of the Greek endemic genus *Hymenonema* (*Compositae*, *Cichorieae*)

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The genus *Hymenonema* Cass. (*Compositae*, *Cichorieae*) is of great interest, because it is one of the eight endemic genera of Greece and the only one that consists of two species, i.e. *Hymenonema laconicum* Boiss & Heldr. and *H. graecum* (L.) DC. *H. laconicum* grows at the lowlands of the C. & S. Peloponnisos Mountains, while *H. graecum* occurs on most Kiklades islands and islets and in NW. Kriti, although its presence in the latter is considered doubtful.

In the framework of the first author's MSc dissertation, the genus *Hymenonema* was studied from systematic, morphological, karyological and phylogenetic point of view. So far, no specific study is known to have focused on *Hymenonema* in any of the above fields. The morphological study of the genus, which concerned the morphological features of capitulum, achenes, pollens and measurements of some other diagnostic characters, led to the development of new taxonomical keys.

The classical cytological squash technique and Feulgen staining were performed in order to determine the chromosome number and karyotype feature for each species. The chromosome number ($2n = 20$) of both species is in accordance with previous studies and their karyotypes are symmetrical, consisting of metacentric (m) and submetacentric (sm) chromosomes.

According to the most recent data (Kilian & al. 2009), *Hymenonema* and the genera *Catananche* L., *Scolymus* L. and *Gundelia* L. constitute the subtribe Scolyminae. DNA sequence analysis was carried out for 31 accessions including all the species of the subtribe. Four molecular markers from nuclear (nrDNA ITS and the single-copy *D10*) and plastid genome (*trnL-F* and *rpL32-trnL*) were used and analyzed with Maximum Parsimony and Bayesian Inference methods. The results concerning the phylogenetic relationships among the genera in the subtribe Scolyminae and the monophyly of the genus *Hymenonema* are concordant. The two species of *Hymenonema* form a monophyletic group and *Scolymus* appears to be a sister taxon of this genus. The complete dataset, including all markers and accessions, was also input to the species tree reconstruction and divergence time estimation procedure in the program *BEAST, in order to infer a total-evidence tree. According to the results of the species tree, the divergence time between *H. graecum* and *H. laconicum* is estimated around 1.3 Mya ago (0.4-2.3 Mya), i.e. within the Pleistocene.

May essential oil of a native species inhibit seed germination of the invasive *Acacia saligna* (*Fabaceae*)?

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Invasive Alien Species (IAS) are considered, after habitat loss and fragmentation, as one of the greatest threats to the conservation of native biodiversity and natural ecosystems worldwide. *Acacia saligna* (Labill.) H.L.Wendl. (*Fabaceae*) is native of South-Western Australia, but has been planted extensively in many areas of the world, among which the Mediterranean Region, becoming highly invasive especially in coastal habitats. In Mediterranean ecosystems, several autochthonous species produce essential oils (EOs), in different concentrations in several parts of the plant, as adaptation to harsh environments. The ecological role of these compounds, named allelochemicals, may determine a positive influence and/or negative against other target organisms. The aim of this work was to test if the EO of *Rosmarinus officinalis* L. (*Lamiaceae*), an aromatic dwarf-shrub of the Mediterranean area, may be an effective method to inhibit the seed germination of the invasive *A. saligna*. In particular, variability in seed germination requirements and responses among populations from Sardinia and Sicily (Italy) were evaluated. Germination tests under light (12 hours of irradiance per day), constant temperatures (10, 15, 20°C) and several concentrations of *R. officinalis* EO (3.9, 7.8, 15.6 µl/ml) were carried out. Moreover, the ability of *A. saligna* seeds to recover their germination after the EO exposure was evaluated washing seeds with Tween 80 or sodium hypochlorite solutions. Among the examined factors, only the EO concentration and temperature had highly significant effect on seed germination. The lowest EO concentration did not show differences respect to the control (0 µl/ml), while the highest concentration inhibited significantly seed germination of all populations at all the tested temperatures. No seed recovered the ability to germinate after the EO exposure with none of the two methods of washing. Our results allowed to identify the minimum concentration of EO of an autochthonous species such as *R. officinalis*, able to inhibit the seed germination of the invasive *A. saligna*. In conclusion, these results may be useful for the biological control of this invasive species.

A multidisciplinary approach reveals cryptic taxa within Mediterranean lineages of *Carex* (*Cyperaceae*)

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With about 150 taxa, *Carex* is one of the richest plant genera in the Mediterranean hotspot of biodiversity. Its complex taxonomy is mainly due to extreme morphological reduction of diagnostic characters and, in some groups, to hybridization too. We used a multidisciplinary approach combining molecular and morphological data to elucidate the taxonomic circumscription of three different *Carex* species complexes present in the Mediterranean: *C. furva* s. l. (section *Glareosae*), endemic to the high mountains of the Iberian Peninsula; *C. pendula* s. l. (sect. *Rhynchocystis*), widely distributed in the Western Paleartic; and *C. reuteriana*-*C. panormitana* (sect. *Phacocystis*), disjunctly distributed in the Western and Central Mediterranean (Iberian Peninsula, North West Africa, Sicily and Sardinia). We performed phylogenetic analyses based on different markers (nuclear and plastid DNA sequences, AFLPs, RADseq), as well as morphometric studies based on herbarium specimens, sampling across all the groups' ranges. Overall, our results suggest the existence of unnoticed cryptic taxa within the three species groups, which display a degree of genetic and morphological differentiation, enough to consider them at the species level. In *C. furva* s. l., we now recognize a new species endemic to the Iberian Peninsula (Sierra Nevada, Central system, Cantabrian range and Serra da Estrela), while *C. furva* s. s. is restricted to a few populations in Sierra Nevada, where both species co-occur, and is threatened by recurrent hybridization with the new species. In *C. pendula* s. l., two mostly allopatric lineages were detected, an eastern lineage distributed from central Europe to the Caucasus and western Iran, and a western lineage present in central and western Europe, the Mediterranean Basin (including northwestern Africa and Cyprus), and Macaronesia. The type of *C. agastachys*, traditionally subsumed within *C. pendula*, matches the diagnostic characters of the eastern lineage, thus resurrecting this name for this long unnoticed species. Finally, in *C. reuteriana* and *C. panormitana*, a clear genetic differentiation was detected between them, supporting their species status. Within *C. panormitana*, the Sicilian and Tunisian populations were found to be closely related, whereas the populations from Sardinia were as different from all the other *C. panormitana* populations as they were from *C. reuteriana*. It strongly suggests that the Sardinian populations should deserve taxonomic recognition.

Rules of thumbs are sometimes valid: very low genetic diversity in two extremely narrow endemics from Majorca Island (W Mediterranean)

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Low levels of genetic diversity in endemic species are generally attributable to the small size of their populations. This lack of genetic variability will, predictably, be more evident in those species that occur in only one or a very few localities with a total population consisting of a few dozen individuals, or sometimes fewer. López-Pujol & al. (2013) defined Extremely Narrow Endemics (ENEs) as those plant taxa that usually occur in one or very few populations with total species' census lower to 500 individuals, and obtained a mean value of 0.057 for H_e. We present the results from two ENEs from Majorca (Balearic Islands, W Mediterranean Basin): *Agrostis barceloi* (*Poaceae*) and *Coristospermum huteri* (*Apiaceae*). Both taxa have a total population fewer than 100 individuals and are restricted to the summit of Puig Major Mountain, the highest point of the island. As predicted, they have a nearly absence of genetic polymorphism as revealed by allozyme electrophoresis: A = 1.22 and H_e = 0.113 for *Agrostis barceloi,* although the apparently moderate heterozygosity is due to the occurrence of fixed heterozygosity at four loci—all the analyzed individuals showed the same genotype; and A = 1.08 and H_e = 0.022 for *Coristospermum huteri.* The reasons for this genetic uniformity may include insularity (founder effect) but also human activities. Within the context of the recovery plan, some conservation measures are proposed, including the preservation of the mountain summit where the species is found which would also positively influence the conservation of other co-occurring rare and threatened species.

López-Pujol, J., Martinell, M. C., Massó, S., Blanché, C. & Sáez, L. 2013: The 'paradigm of extremes': extremely low genetic diversity in an extremely narrow endemic species, *Coristospermum huteri* (*Umbelliferae*). – Pl. Syst. Evol. **299:** 439-446.

Synopsis of *Romulea* (*Iridaceae*) on the Maltese islands

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This study departed from the basic knowledge concerning the *Romulea* (*Iridaceae*) on the Maltese islands. *R. ramiflora* Ten. was considered as very common, *R. rollii* Parl. as common, *R. columnae* Sebast. & Mauri as frequent, *R. melitensis* Beg. has an uncertain status and *R. bulbocodium* (L.) Sebast. & Mauri was recorded in the past without recent findings. A revision of the genus *Romulea* for the Maltese islands have been carried out using classical morphometric analysis and cytological investigations. *Romulea* species at the southeast coast of Sicily were also included in this study. This study resulted in significant taxanomic changes.

R. rollii and *R. bulbocodium* are excluded from the Maltese flora and *R. ramiflora* turned to be a rare sand Crocus. *R. melitensis* was found to be a *nomen confusum* and remains a doubtful, unconfirmed species with a yellow throat, dark violet perianth and very narrow tepals according to the Beguinot's first protologue and its connoted type specimens. Specimens with these characters set have not been found in the present study. The most common sand Crocus occurring in the Maltese isalnds (previously misidentified as *R. ramiflora* and/or *R. rollii*) is described as a new species: *R. variicolor* S. Mifsud. This species was found to be very variable and three varieties (var. *variicolor*, var. *mirandae* and var. *martynii*) were further described, primarily based on the colour and patterns of the abaxial side of the outer tepals.

Taxonomic observations of *R. columnae* subsp. *rollii* (Parl.) Marais. from Ragusa, Sicily support its distinction and suggested to be erected back to *R. rollii* instead of its current treatment of being conspecific with or infraspecific of *R. columane*. New populations of *R. rollii* and *R. variicolor* are reported from Ragusa (Sicily). In addition, examples of terata and hypothetical hybrids are documented for the first time, with the latter having a close resemblance with *R. melitensis* as originally described by Beguinot in 1907. The synonymisation of *R. tenuifollia* Lojac. with *R. rollii* is also questioned and further investigation are needed.

Données préliminaires pour l'évaluation des menaces selon les critères de la liste rouge UICN de *Salvia balansae* (*Lamiaceae*), endémique d'Algérie

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Salvia balansae De Noé est une *Lamiaceae* endémique d'Algérie, présente en deux localités très distinctes, Mostaganem sur le littoral nord-ouest et Les Aurès dans les montagnes de l'Est. Les populations de cette dernière localités sont en cours d'étude taxonomique, et les résultats incitent à un traitement séparé. De ce fait, le taxon de Mostaganem représente une endémique à aire de distribution restreinte. Une cartographie historique datant des années 1950 nous permet de connaître l'étendue des faciès de végétation hébergeant cette espèce dans la basse vallée du Chéliff, près de Mostaganem. Nous présentons un premier travail d'inventaire sur le terrain des stations, de leur superficie et de la qualité des habitats. L'objectif de ce travail est de rassembler les données nécessaires à l'évaluation de la menace de *S. balansae* dans la région de Mostaganem selon les critères de l'UICN. Les critères A, B, C et D pourront être utilisés pour réévaluer selon les catégories en vigueur (3.1) cette espèce autrefois classée « rare » par la Liste rouge mondiale de 1997.

Unnoticed diversity within the moss genus *Ceratodon* (*Ditrichaceae*)

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Ceratodon purpureus, together with *Physcomytrella patens* and *Funaria hygrometrica*, has long been used as model organism in plant physiology, development and genetics (Cove & al. 1997). It is a cosmopolitan moss with a variable morphology, which complicates species delimitation between *C. purpureus* and related species. Following the revision of the genus *Ceratodon* by Burley & Pritchard (1990) there are four species, being one of them the cosmopolitan *C. purpureus*. Nevertheless other authors reduce to two the number of species.

Studying the genetic diversity of *C. purpureus* in Sierra Nevada Mountains (Spain) a different genotype was observed. 61 specimens were sequenced using 9 nuclear *loci*, 30 from Sierra Nevada Mountains and 31 from other sides from Spain and other European countries. To resolve its taxonomic identity, a biometric study was completed. 17 morphological gametophytic characters were selected. Sporophyte characters were not taken into account because Sierra Nevada samples are always unfructified. Measurements were taken from plants collected in field and also after being grown under controlled conditions in the laboratory. R software was used for statistical analyses and graphics.

Two well supported clades were obtained from each sequenced *locus*; surprisingly 29.5% of the individuals changed between both clades depending on the *locus* (they are considered hybrids). Based on biometric results, both in field and in cultured samples, two different groups were observed, one with majority of samples of Europe and central Spain and other which includes Sierra Nevada Mountains samples and a few ones from outside.

The morphology of samples mainly from Europe and central Spain corresponds with *C. purpureus*, whereas the samples from Sierra Nevada present more affinity with *C. conicus*. This dichotomy is supported by genetic data. Genetic hybrids do not exhibit morphological intermediate traits; they also have *C. conicus* morphology. In Sierra Nevada the species is very abundant while out from there it becomes rare and infrequent, even at a short distance like in central Spain.

The data presented herein show that there is much genetic diversity in the genus *Ceratodon* as suggested by prior studies. *C. conicus* is considered here to be a hybrid between *C. purpureus* and a new species, at this moment only found in Sierra Nevada Mountains and some localities of southeastern Spain.

Cove, D. J., Knight, C. & Lamparter, T. 1997: Mosses as model systems. – Trends Pl. Sci. **2:** 99-105.
Burley, J. S. & Pritchard, N. M. 1990: Revision of the genus *Ceratodon* (*Bryophyta*). – Harvard Papers **2:** 17-76.

Pau's taxa from Morocco: summary and typification

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Carlos Pau (1857-1937) was one of the first Spanish botanists interested in the flora of Northern Morocco. He began to study it in 1908, thanks to some plants that he received from other naturalists. During the next 28 years, until his death, he described about 400 taxa from this area. Although there is an exhaustive list of Pau's taxa (Carrasco 1975), it is not complete and the typification of the majority of the names is still to be considered. In this poster we present an outline of the taxa described by Pau from Morocco, the temporal and geographic distribution of the original material, and a selection of some interesting types of these taxa.

The main source of original Pau's names is the personal collection of the author (c. 100,000 specimens), included in the MA Herbarium of the "Real Jardín Botánico de Madrid" after his death. Original material can also be found in the BC Herbarium of the Botanical Institute of Barcelona due the close relationship between Pau and Pius Font Quer, the curator of this herbarium at that time. Numerous types are represented in the exsiccata series *ITER MAROCCANUM* (1927-1932) that Font Quer edited and distributed to other herbaria.

Carrasco, M. A. 1975: Contribución a la obra taxonómica de Carlos Pau. – Trab. Dep. Bot. (Madrid) **8:** 1-171.

Drought tolerance in germination of *Aegilops geniculata* (*Poaceae*) populations along a latitudinal gradient: implications for crop improvement

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Crop wild relatives (CWR) represent important sources of useful alleles for plant breeding and crop improvement. Wheat is one of the most important and widely cultivated cereal crops in the world, and the genus *Aegilops* L., a Mediterranean–western Asiatic element occurring in southern Europe, North Africa, the Middle East, and western and central Asia, represents the secondary gene pool of wheat (Kilian & al. 2011). In order to find suitable populations for improving drought tolerance in wheat, we investigate it at germination stage for different *Aegilops geniculata* Roth. accessions collected along a latitudinal gradient. *Ae. geniculata* is the most widespread species of the genus, with a large ecological amplitude (from sea level to 1750 m a.sl.) and it shows the largest variability in seed germination at different temperatures compared to other *Aegilops* species (Guzzon & al. 2015). As a comparison, we used different accessions of *Aegilops neglecta* Req. ex Bertol., *Triticum aestivum* L. and *T. durum* Desf. In full hydration, germination was high in all populations, but increasing drought stress led to reduced and delayed germination. Populations show significant differences in final germination and mean germination time (MGT). Wheat, durum wheat and the southern population of *Aegilops geniculata* were not significantly affected by drought stress, germinating similarly under all treatments. Conversely, northern populations of *Aegilops geniculata* were significantly reduced under high water stress treatment. Different behaviour in populations of the same species could be explained by different rainfall pattern during seed development and maturation. Results highlight the importance of a good choice of source population for genotype selection in crop improvement.

Guzzon, F., Müller, J. V., Abeli, T., Cauzzi, P., Ardenghi, N. M. G., Balestrazzi, A., Rossi, G. & Orsenigo, S. 2015: Germination requirements of nine European Aegilops species in relation to constant and alternating temperatures. – Acta Bot. Gallica **162:** 349-354.

Kilian, B., Mammen, K., Millet, E., Sharma, R., Graner, A., Salamini, F., Hammer, K. & Özkan, H. (2011): Chapter 1 Aegilops. – Pp. 1-76 in: Kole, C. (Ed.), Wild Crop Relatives Genomic and Breeding Resources, Cereals. – Berlin.

Smyrnium dimartinoi (*Apiaceae*): taxonomic remarks and distribution

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Smyrnium L., an Eurasian genus of the family *Apiaceae*, includes about 20 taxa of which only 7 are accepted at specific rank; among these, 5 are native to Europe (Tutin & al. 1968; Gomez 2003). In the Italian flora the genus is represented by 3 taxa also occurring in Sicily (Pignatti 1982; Giardina & al. 2007); these are *Smyrnium olusatrum* L., *S. perfoliatum* L. and *S. rotundifolium* Mill. The last one has also been treated at the rank of subspecies under *S. perfoliatum* [*S. perfoliatum* subsp. *rotundifolium* (Mill.) Hartvig] (Strid 1986; Conti & al. 2005), or as a variety [*S. perfoliatum* var. *rotundifolium* (Mill.) Fiori (Fiori 1925)]. In Sicily, populations related to *S. perfoliatum* differ from this taxon for both morphological and ecological characteristics, especially on the Madonie Mountains and the Mountains around Palermo.

The study of the morphological characteristics – namely of the root, stem, and leaf – allowed to clearly distinguish these populations that therefore represented a taxonomically and perhaps even chorologically critical case, since similar plants occurring in Greece were described as *S. rotundifolium* var. *ovatifolium* Halácsy (Halácsy 1901). In Sicily that population was finally described as a new species named *Smyrnium dimartinoi* (Raimondo & al. 2015), to commemorate Andrea Di Martino (1926-2009), professor of botany and director of the Botanical Garden and Herbarium Mediterraneum in the Palermo University.

The occurrence of the new taxon related to *S. perfoliatum* – ascertained only in Central-Western Sicily and in Crete – has also been supposed in other countries of the Mediterranean Europe; this, owing to some critical specimens observed in PAL and PAL-Gr.

In this contribution, the analytical key of *S. perfoliatum* group is presented. Furthermore, the geographical distribution of *S. dimartinoi* is specified, based on the study of selected exsiccata from other Italian and foreign herbaria. The results of this research show that *S. dimartinoi* belongs to the Eurimediterranean element, spread in various countries of the Southern Europe, from Greece to Italy and Spain.

Conti, F., Abbate, G., Alessandrini, A. & Blasi, C. 2005: An annotated checklist of the Italian vascular flora. – Roma.
Fiori, A. 1925: Nuova Flora analitica d'Italia, **2.** – Firenze.
Halàksy, E. 1901: Conspectus Florae Graecae, **1.** – Lipsiae.
Pignatti, S. 1982: Flora d'Italia, **1.** – Bologna.
Raimondo, F. M., Mazzola, P. & Spadaro, V. 2015: A new species of *Smyrnium* (*Apiaceae*) related to *S. perfoliatum*. – Fl. Medit. **25:** 137-142.
Strid, A. 1986: Mountain Flora of Greece, **1.** – Cambridge.
Tutin T. G. & al. 1968: Flora Europaea, **2.** – Cambridge.

Molecular phylogeny of *Fibigia* (*Brassicaceae*) and allied genera

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Numerous molecular systematic studies within *Brassicaceae* have resulted in a strongly improved classification of the family, as morphologically defined units at and above the generic level were often found to poorly reflect phylogenetic relationships. Recently the study of tribe *Alysseae* provided insight into the generic circumscriptions of one of the largest tribes within *Brassicaceae*, which harbours about 7% of the family's species diversity. One of the identified monophyletic clades was the *Fibigia* clade encompassing several species poor genera, namely *Alyssoides, Clastopus, Degenia, Fibigia* and *Physoptychis*. The genera within the clade are mainly distributed within Irano-Turanian floristic region, with some taxa occurring in the Mediterranean region and the majority of species exhibiting a narrow geographic range ("narrow endemics"). Morphologically, species of this clade are characterized by being perennial herbs, subshrubs or shrubs with an indumentum of stellate hairs sometimes mixed with simple ones, relatively large yellow or purple flowers and large fruits with mostly winged seeds. Additionally, this clade encompasses greater fruit diversity than the rest of the tribe; being dehiscent or indehiscent, inflated fruits or strongly compressed, with papery, leathery or thickened valves. The initial phylogenetic analysis revealed that the largest genus in the clade, *Fibigia* was not monophyletic and the relationships among genera were poorly resolved and burdened with incongruences among markers. In order to provide further insight into phylogenetic relationships we included additional taxa, encompassing the majority of species in the clade. To this end, we obtained sequence data from the nrDNA ITS and *ndh*F gene plastid region. The non-monophyly of *Fibigia* was confirmed and six lineages were identified. Most lineages were strongly supported and included only one species supporting the taxonomical recognition of additional monotypic genera. However, *F. afghanica*, *F. membranacea* and *F. multicaulis* were intermingled with genera *Clastopus* and *Straussiella* indicating complex phylogenetic relationships. Separation of genus *Alyssoides* into monotypic *Alyssoides* including *A. utriculata* and monotypic *Lutzia* with *L. cretica* was also confirmed.

A research on nomenclatural types of the names in *Trifolium* (*Fabaceae*) described by Gaetano Savi

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Gaetano Savi (1769-1844) worked in the University of Pisa and was a prominent figure among Italian botanists of the XIX century. He published about 75 scientific papers, primarily devoted to floristic researches and taxonomical investigations. In his career, he described 89 taxa of vascular plants (6 genera and 83 species): more than one third of these (3 genera and 30 species) belonging to *Fabaceae*. Within this family, eleven names pertain to *Trifolium* L.: *T. elegans*, *T. michelianum*, *T. rigidum*, *T. vesiculosum*, all described in 1798 within *Flora Pisana*; *T. bocconei*, *T. conicum*, *T. formosum*, *T. obscurum*, *T. supinum*, all described in 1810 in a specific paper on the genus *Trifolium*; *T. sebastianii*, described in 1815, and *T. praetutianum* described in 1825 in the fourth volume of *Botanicon Etruscum*. Seven of these taxa are currently accepted as originally described (*T. bocconei*, *T. michelianum*, *T. obsurum*, *T. sebastianii*, and *T. vesiculosum*) or recombined at subspecific rank (*T. hybridum* subsp. *elegans* (Savi) Asch. & Graebn. and *T. noricum* subsp. *praetutianum* (Savi) Arcang.), whereas the remaining four names are treated as heterotypic synonyms (*T. conicum*, *T. formosum*, *T. rigidum*, and *T. supinum*). For most of these names, any information about nomenclatural types is lacking.

In the frame of a typification project devoted to the names described by Gaetano Savi, we performed an extensive herbarium and literature research in order to provide information on nomenclatural types and original material of all the above-cited *Trifolium* names. In addition to specimens preserved in the PI herbarium, we also investigated specimens in the following herbaria: BM, FI, G, M, MOD, MW, P, PAD, S, UPS, and W. We also critically discussed the validity of previous typifications found in literature.

According to Art. 40.1 of the International Code of Nomenclature for Algae, Fungi and Plants, the herbarium specimens of *T. conicum*, *T. praetutianum*, and *T. sebastianii* found in PI can be considered as holotypes. For the remaining eight names, we found one or more original materials, except for *T. vesiculosum*. For the latter name, there is a "lectotype" previously designated, but it is an error to be corrected to neotype.

To conclude, our investigations represent a first significant contribution, preparatory to any further taxonomic study involving these names.

Analysis of the bryophyte flora of Morocco and Algeria

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The bryophyte checklists of Morocco and Algeria have been actualized based on the published literature. On the basis of these catalogues a total of 491 species are reported from Morocco and 478 from Algeria. In Morocco, 5 hornworts, 103 liverworts and 383 mosses are known. While in Algeria the species reported for each bryophyte group are: 5 hornworts, 121 liverworts and 352 mosses. Most of the collections were made mainly by French researchers in the first half of the twentieth century, even by non bryologists. In the last decades new research has been made by two research groups of Spanish bryologists, one from the University of Murcia, SE Spain, who have studied the terricolous and saxicolous communities, and the other from the Autonomous University of Madrid, who have studied the epiphytic bryophytes. They have undertaken new collections, especially in Morocco and increased the catalogue with new and interesting species. Also they revised the identity of many taxa described from the Maghreb that were considered as endemics.

The Moroccan and Algerian bryophyte flora is far from being complete and a lot of work should still be done, especially in Algeria. It would be desirable that autochthonous scientists undertook floristic and ecological studies about these group of plants.

In vitro bryophyte collection of the Belgrade University: how important is biotechnological approach to conservation of bryophytes?

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Conservation of bryophytes is rather neglected when compared to tracheophytes. However, the bryophytes took part in many conservation initiative but the conservation measures given rather remain on the passive level. Though, the CBD (International Convention on Biodiversity) gives as one of the focus *ex situ* conservation. Here, we present the in vitro collection of the Bryophyte Biology Group Belgrade (BBGB), at the University of Belgrade. The bryophyte in vitro collection counts up to date 137 species out of 161 accession (different genotypes present for some species). The species originate from around the World, and only the species from South American continent is missing. Among these species, 90.48% are of regional, national or continental conservation interest according to red lists. The collection has 1 hornwort, 7 thallose liverworts, 3 leafy liverworts, 92 acrocarps, 32 pleurocarps and 2 peatmosses. Among BBGB bryophytes, 2 thallose liverworts, 17 acrocarps and 6 pleurocarpous mosses are regionally extinct in some European areas. In total, 39 species are CR in some of European countries (2 thallose and 1 leafy liverworts; 29 acrocarps, 7 pleurocarps), 55 are in EN and 80 are in VU threat category. The propagation took part for some of the species and lab-propagated materials after acclimatization were subject of reintroduction and population strengthening efforts in Serbia and Hungary. However, these were not easy tasks to achieve, since many bryophyte species are rather different in needs and each species needs to be studied prior to find adequate treatments and conditions for optimal growth. Some species do not germinate and express some kind of dormancy (e.g. *Riella helicophylla*), some other needs sugar addition as carbon source (e.g. *Polytrichum formosum*), while some other use it as signal molecule for triggering to next developmental stage (e.g. some *Bryum* species). Some species do need temperature variation or external addition of plant growth regulators to develop gametophores. The combination and concentration of plant growth regulators can be species specific. Some species react thus to produce callus in some treatment. Bryophytes do react to different media types and pH. The light quality and duration can lead to phenomena such as apospory (e.g. *Amblystegium serpens* or *Enthostodon hungaricus*). Some externally added agents can lead to one sex expression while supreme the other in accordance of labile sex expression in bryophytes. Here, we present problems, solutions, trends and achievements of biotechnological approach in the conservation biology of bryophytes.

Karyomorphometric analysis of *Fritillaria obliqua* group (*Liliaceae*) in Greece

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Fritillaria L. (*Liliaceae*) is a genus of geophytes, represented in Greece by 29 taxa and divided into six groups following karyomorphological characters and biogeographical data. *Fritillaria obliqua* group consists of seven taxa. All of them are Greek endemics, with mostly dark purplish-brown flowers, found at low altitudes in the eastern and south part of continental Greece and on the west and central Aegean islands. Five of them are included in the Red Data Book of Rare and Threatened Plants of Greece. More specifically the taxa of the group are: *Fritillaria davisii* Turrill, *F. ehrhartii* Boiss. & Orph., *F. obliqua* Ker-Gawler, with two subspecies, the typical one (Near Threatened) and subsp. *tuntasia* (Halácsy) Kamari (Vulnerable), *F. rhodokanakis* Baker (Vulnerable), *F. spetsiotica* Kamari (Vulnerable) and *F. sporadum* Kamari (Vulnerable). The somatic number $2n = 2x = 24$ is common for the above taxa, while 1 to 5 B-chromosomes are observed in most of them. Besides the classical cytotaxonomic study, karyomorphometric analysis is also given. Except from the karyotype, minimum (min), maximum (max), total (TCL) and average (ACL) length of the chromosomes are examined here for the first time. Moreover, the interchromosomal (CV_{CL}) and intrachromosomal asymmetry (M_{CA}) are estimated. In the case of marker chromosomes, r-index, R-length, centromeric index and arm difference ratio are presented.

An ethnobotanical review on uses of the wild *Pinaceae* in Turkey

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Information about ethnobotanical uses of the *Pinaceae* in Turkey is represented in this study. The family *Pinaceae* has 13 genera in the world, 4 genera of them (*Pinus, Cedrus, Abies, Picea*) are located wildly in Turkey. Approximately half of the taxa (10 of 19) which belong to these genera are East Mediterranean elements and 4 of 19 taxa (*Abies cilicica* subsp. *isaurica*, *A. nordmanniana* subsp. *equi-trojani*, *Pinus brutia* var. *pendulifolia*, *P. nigra* subsp. *pallasiana* var. *fastigiata*) are endemic (21%) to Turkey.

Pinaceae members have a wide distribution area in Turkey. According to the records, these plants grow extensively from the sea level to 2500 m and spread in South, North and West Anatolia, which constitute the majority of the forests of Turkey.

According to our observations and literature records 9 of 19 *Pinaceae* taxa have ethnobotanical uses in Turkey. They are used as herbal medicine, food, tea, spice, firewood, furniture, construction material, agricultural tool, toy and ornament. Especially medicinal usage is the most common way of their utilization among local people. The most frequent medicinal uses of them are for the digestive system, respiratory system and skin diseases.

Diversité lichenique de la péninsule de l'Edough au Nord-Est Algérien

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Les lichens sont des organismes symbiotiques, composés par l'association d'algues (généralement *Cyanobactéries* et *Chlorophytes*) et de champignons, produisent une gamme de composés secondaires, dont la plupart sont spécifiques. Le mycobionte domine l'association, il assure deux principaux rôles dans cette symbiose: protéger le photobionte de l'exposition intense à la lumière du soleil ainsi que la dessiccation et absorber les nutriments minéraux. Le photobionte a également deux rôles: synthétiser les éléments nutritifs organiques à partir du dioxyde de carbone et, dans le cas des cyanobactéries, produire l'ammonium (et les composés azotés puis organiques) à partir de la fixation de l'azote.

Parmi les organismes vivants dans les forêts les lichens présentent un intérêt particulier du fait de la précision avec laquelle ils intègrent les facteurs écologiques. Environ 18.500 différentes espèces de lichens ont été décrites partout dans le monde.

En Algérie, de nombreuses données intéressantes ont été publiées concernant la flore des lichens et l'article de Amrani et ses collaborateurs donne un très bon aperçu de l'histoire de la lichénologie depuis 1799 jusqu'à 2013. Néanmoins, la connaissance de cette flore reste encore très fragmentaire et incomplète. La présente étude a eu pour objet la prospection lichénologique de la station dite «Les Cascades des Vautours», site historique localisé à une altitude de 442 m, au niveau de la péninsule de l'Edough, sur la côte nord-est algérienne. Les précipitations annuelles sont relativement abondantes, de l'ordre de 1000 mm.

Cinquante-trois taxa ont été recensés appartenant à 17 familles dont 2 taxa n'ont jamais été cité dans la flore lichenique algérienne, cette diversité montre l'intérêt de ce site qui constitue également selon d'autres travaux floristiques une Zone Importante pour les Plantes (ZIP) algérienne. Il comporte en effet une grande diversité floristique et une richesse en taxons endémiques et sub-endémiques qui devrait lui permettre de faire partie des sites RAMSAR.

Karyological knowledge of the Catalan vascular flora inferred from "CromoCat" database

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The chromosome database of the wild vascular flora of the Catalan Countries (CromoCat) contains a total of 57.7012 records, documented in 8157 bibliographic references. It includes 3135 chromosome number reports from the territories covered by the *Flora dels Països Catalans* by Bolòs & al. (2005), representing 27.7% of the total number of taxa (species and subspecies). The database is available through the Flora module of the *Banc de Dades de Biodiversitat de Catalunya* (http://biodiver.bio.ub.es/biocat/).

CromoCat began gathering cytogenetic information in 1999 and, at the end of 2015, the data corresponding to Catalonia (currently an autonomous region within Spain) included 604 taxa, about 14.4% of the vascular flora (a much lower coverage than other regions as Valencian Country, Aragon Strip or Balearic Islands).

The oldest recorded chromosome numbers belong to *Diplotaxis erucoides* ($2n = 14$) and dates back from 1926. *Silene ciliata* (*Caryophyllaceae*) is the species with the highest reported number ($2n =$ c.228), whereas *Comastoma tenellum* (*Gentianaceae*) bear the lowest count ($2n = 10$). A total of 134 different numbers and cytotypes have been recorded.

The geographic distribution of chromosome data is heterogeneous: while Barcelona and Girona provinces show low count percentages (13.15 % and 16.55 %, respectively), a more substantial part comes from Tarragona (33.02 %) and mainly Lleida (37.28 %). The distribution by county (="comarca") reveals that the greatest karyological diversity and intensity of chromosomic exploration corresponds to the Pyrenees, followed by the Ebre Delta and Ports Massif. These data also coincide with the concentration of endemic species.

Concerning the taxonomic representation of the data stored in CromoCat, the genus with more counts from Catalan populations is *Bromus* (*Poaceae*) with 115 reports, followed by *Campanula* (*Campanulaceae*), with 72 (data explained by the amount of information included in several Ph.D.). The distribution of counts by botanical families places the *Poaceae* in the first rank (171 species with chromosome data), followed by *Compositae* (135).

Combining chromosome reports from Catalan and foreign populations, only 215 taxa (4.44%) still remain karyologically unknown. This limited pack identifies the needs for further research where 3 main groups (c. 1/3 each) can be recognized: a) complex genera, 74 taxa (*Alchemilla*, *Hieracium* and *Rubus*); b) taxonomically unresolved, 40 taxa (but waiting for a revised thesaurus of the Catalan flora, ongoing) and c) 83 taxa truly not counted (or count not captured by CromoCat), some of them endemic.

Anatomical studies of *Pseudosempervivum aucheri* (*Brassicaceae*), endemic to Turkey

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In this study, the anatomical characters of the root, stem and leaf of *Pseudosempervivum aucheri* (Boiss.) Pobed. (*Brassicaceae*) are investigated. In the *Flora of Turkey*, the genus *Pseudosempervivum* (sub. *Cochlearia*) is represented by 3 species and *Pseudosempervivum aucheri* (= *Cochlearia aucheri* Boiss.) is reported from few localities. At present, the genus *Pseudosempervivum* known locally "kaşıkotu" is represented by 6 species in Turkey [Güner A. 2012: A Checklist of the Flora of Turkey (Vascular Plants): 292]. But in the literature survey, there was no report on the anatomy of this genus. Microscopic views of traverse sections of root, stem and leaf were examined and described in detail and supported by photographs. The root is at the secondary and the stem is at the primary structure. In root, while cambium layer is distinguishable and consists of 1-3 cell layers; in stem, cambium is indistinguishable. In leaf anatomy, mesophyll consists of 9-11 layered palisade parenchyma cells, which are cylindrical, rectangular or rectangular oval shaped. There are gaps between palisade parenchyma cells. In middle area of the mesophyll layer, there are almost equal sized vascular bundles. Leaf is thick, equifacial and stomata are anisocytic type.

Lichen communities in extreme desert conditions

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The investigation of biodiversity in stressful habitats is of great interest because it elucidates relationships between organisms and their environment, as well as revealing the mechanisms of their survival and adaptation to extreme conditions. Deserts represent such stressful habitats where harsh climate and limited resources greatly influence the formation of biota. In order to understand the link between environmental variability in extreme desert conditions and species composition and structure of lichen communities, the present study was conducted. For this purpose, the lichen communities on soil and cobbles at several sites in the Negev desert were examined. These sites were located in areas having different rain precipitation and different air temperatures. Four sites were established in the area of Makhtesh Ramon, erosional cirque in the central Negev, two of which were located in the northern part of the cirque, where rainfall was 85 mm per year and mean annual air temperature was 17 °C, and two sites were located in the southern part of the cirque, where rainfall was 56 mm per year and mean annual air temperature was 23 °C. The fifth site was established in the canyon in Nahal Shaharut, in the southern Negev, where rainfall was 40 mm per year and mean annual air temperature was 24 °C. Here, the lichen communities of both substrates were studied on six stations of two opposite slopes of the canyon. To evaluate the saxicolous lichen communities, 20 cobbles were randomly collected from each site in Makhtesh Ramon and from each station in Nahal Shaharut. The terricolous lichen communities (20 at each site and each station) were studied using a 20×20 cm quadrat with a 2×2 cm grid. At each site and each station three environmental variables were evaluated: soil moisture, and temperatures of soil and cobbles. The Canonical Correspondence Analysis was used to study the influence of ecological factors on species composition and structure of lichen communities. Our study showed that the lichen communities on each of the substrates at studied sites significantly differed from each other. This fact demonstrates the effect of climatic factors on the species composition and structure of lichen communities. A comparative analysis of structure and distribution of lichen communities on soil and cobbles at each of the sites revealed that while soil moisture and temperatures of substrates influenced the distribution of saxicolous lichens, these factors had no effect on the distribution of terricolous lichens.

Molecular and phenotypic variation in *Leucanthemopsis alpina* (*Compositae*, *Anthemideae*) and consequences for its infraspecific classification

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Polyploidisation is one of the most important processes producing diversification in many Alpine plant groups. With its distribution range covering the whole Alpine range and further European mountain systems (Pyrenees, Apennine, Carpathians), its restriction to soils over siliceous bedrock, and its variation in ploidy levels, the Alpine marguerite *Leucanthemopsis alpina* (*Compositae*, *Anthemideae*) is a very suitable model system for polyploid diversification in a high-mountain system. *L. alpina* is a little caespitose, scapose perennial herbs, growing in high alpine environments at altitudes between 2000 and 3600 m. It constitutes a polymorphic complex from a morphological point of view, and several intraspecific taxa at different taxonomic level have been described in the past. Leaf dimension, the extent of leaf incisions, the spacing of the leaflets, and the abundance of indumentum were used as important morphological characters to disentangle morphological diversity in the species in the past. We have studied ploidy levels for populations throughout the distribution range of the species by DAPI flow cytometry, used sequence information from cpDNA intergenic spacer regions and AFLP fingerprinting for phylogeographical analyses, and multivariate statistics for inference of patterns in morphological characteristics. Summarising evidence from the different approaches used in the present study, it is possible to distinguish seven geographical races within the *L. alpina* polyploid complex, for which we consider the subspecific rank the most appropriate one. With the present contribution, we aim at presenting a revised intraspecific classification for this polymorphic complex, based on the results of the above mentioned different approaches.

New data and insights for the proposed hybrid genus *Malosorbus* (*Rosaceae*)

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×*Malosorbus* Browicz was described as a hybrid genus between *Malus* Mill. and *Sorbus* L. However its single species, *Malosorbus* ×*florentina* Browicz was subsequently suggested to belong to *Malus*. Past taxonomic treatments of *Malosorbus* ×*florentina* are discussed in the light of new results pertaining to leaf and seed morphology. Leaf epidermis structure and seed surface sculpturing of ×*Malosorbus*, *Sorbus* and *Malus* material from Turkey were studied using light and scanning electron microscopy. Ornamentation of cuticle and seeds, micromorphology of stomata, trichomes and epicuticular wax , characters of taxonomic importance, have been determined for the first time in these genera. Taxonomic assignment of the supposed hybrid genus has been evaluated. Our data show that ×*Malosorbus* is similar to *Malus* species rather than *Sorbus*, and is not a hybrid genus. The placement of *Malosorbus florentina* in *Malus* is therefore accepted.

Can leaf anatomy help in *Carex* taxonomy? The case study of *Carex panormitana* (*Cyperaceae*)

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Leaf anatomy in the genus *Carex* has been widely studied and its terminology is quite well defined. The use of leaf anatomy as significant micro-morphological character and to detect environment adaptations of species to climate and to micro-climate is usually quite accepted. Here the leaf anatomy was tested to value the possible differences among populations, in the case of a species with a peculiar distribution.

Some results on the leaf anatomy of *Carex panormitana*, coming from all its known Sardinian populations, are reported. The reliability of observations made on fresh material, either from wild populations (*in situ*) or from individuals kept in cultivation (*ex situ*) and from herbarium material was tested. For this latest, material coming from different Sardinian sites was used to evaluate if some characteristics observed were the same in material coming from different growth conditions, and if the dehydration of the specimen could affect leaf anatomy. Sardinia was a perfect region to test this: 1. Many sites are known, from the Sette Fratelli or the Flumendosa river in the South, to the Limbara Region in the North; 2. Different plants coming from different sites are kept in cultivation; 3. Herbarium specimens from many of sites occur.

The most interesting characteristics tested were leaf shape in cross section; air-cavities; number and relative dimensions of vascular bundles; sclerenchyma strands, silica bodies; Bulliform cells; photosynthetic parenchyma. A clear uniformity of the micromorphology of some characteristics in the leaves of individuals coming from the different Sardinian sites, either from *in situ* or *ex situ* or from herbarium material, is confirmed. These observations make reliable leaf anatomy studies on few herbarium specimens or even on single individual, in the case of a rare or very localized species, like *C. panormitana* in its Sicilian and Tunisian populations. Finally, the substantial uniformity of some characteristics of the leaf anatomy makes possible to interpret the Sardinian populations as one as the meta-population of *C. panormitana*.

Phylogenetic analysis of the Turkish *Ornithogalum* species (*Liliaceae*)

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In this study, *Ornithogalum* L. (*Liliaceae*) taxa occurring wild in Turkey were assessed phylogenetically using the ITS (ribosomal DNA) gene region. The main aim of this study is to propose a classification of the Turkish *Ornithogalum* species based on the phylogenetic system. Secondly, to propose a natural delimitation of this genus. Some authors have recognized a single genus (*Ornithogalum*) for the whole subfamily, including 250-300 species, whereas others have recognized many genera. It was conducted phylogenetic trees analysis by MrBayes and the PAUP. Phylogeography has performed to reveal the relationships of taxa through the network analysis. Our findings point out that Turkey is one of the most important gene and diversification center for the genus *Ornithogalum*. Therefore, it includes many regional and local endemic species. As a general result, according to ITS data, *Ornithogalum* is a large monophyletic genus with high morphological variavility.

Mediterranean carob populations, native or naturalized? A continuing riddle

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Carob (*Cetatonia siliqua* L.) is a well-known Mediterranean tree whose domestication was contemporaneous to that of the first trees (eg. olive, fig) probably in the Middle-East. Since then, carob has played a crucial role in Mediterranean societies due to its edible fruits used for cattle forage and subsistence agriculture. Carob plants are able to grow on stressful rocky soils increasing the socio-economic value of many Mediterranean dry lands. Despite its economic importance, the origins and history of carob populations are still under debate. Since De Candolle, the wildness of carob populations has been questioned on the basis of paleo-botanical, archeological and philological evidences and, unfortunately, the scarce studies on the ecology and genetic diversity of wild populations have not thrown much light on this topic. The extremely low cold-stress tolerance of carob plants constituted the main argument against a long-term persistence of natural populations throughout Pleistocene glaciations in the Mediterranean. Under this scenario, the current distribution would be explained by human dissemination. However, a global phylogeographic study covering the entire distribution of carob is still lacking. In this context, we aimed at exploring the two main hypotheses about the origin of carob populations: their possible persistence in unknown *refugia* during the Pleistocene or their putative naturalization after human dissemination throughout the Mediterranean from a single origin. We used Environment Niche Modeling (ENM) under present and past climatic conditions (MidHolocene –Last Glacial Maximum, LGM; and Last Interglacial Maximum) to investigate the potential range changes that carob could have undergone driven by climatic oscillations. Additionally, we sequenced three plastid regions from both natural and cultivated populations covering the whole current distribution of carob to explore its phylogeography based on coalescent methods. Our results point towards two distant and separated phylogroups at southern boundaries of carob range during LIG, which left a strong genetic footprint within carob natural populations. This was followed by a reduction of the potential distribution area during LGM, which subsequently expanded during Mid-Holocene up to the current Mediterranean known distribution of carob. The current potential distribution modeled for carob is extremely restrictive to the coastal areas of the Mediterranean, and its actual distribution is probably linked to strong selection pressures at the margins of its range. Forthcoming population genetic studies through SSR and SNP markers will reveal the impact of human dissemination versus natural expansion of carob populations.

Current activities on alien plants in Bulgaria

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Targeted research on alien plants in Bulgaria started some 10 years ago. Efforts have been focused on making an inventory of the alien plant species in the Bulgarian flora, study of their distribution and habitat preferences, and identification of the most important pathways for their introduction and further spread. As a result, some 300 species of neophytes have been recorded in the country. Also, a list of 60 invasive and potentially invasive species has been published recently including aliens that have negative impact on native biodiversity as well as taxa that have significantly expanded their distribution range in Bulgaria during the past 20-30 yeas irrespective of their impact on biodiversity. Current activities are focused on developing methodologies for monitoring of selected alien plants, risk assessment protocols and collecting data about the distribution, pathways and impact of the presumably invasive species on the native biodiversity, human health and economy. Two major projects have been funded recently: 1) *Improving the Bulgarian Biodiversity Information System* (IBBIS) with a special work-package on aliens – '*Module for collecting, mapping and analysis of the impact of invasive species on the native Bulgarian species*', and 2) *East and South European Network for Invasive Alien Species – a tool to support the management of alien species in Bulgaria* (ESENIAS-TOOLS). The poster presents the goals, current activities and achieved results within these projects.

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Pollen morphology and its relationship to taxonomy of the genus *Peucedanum* (*Apiaceae*)

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Morphological features of pollen of 15 Turkish taxa belonging to the complex genus *Peucedanum* L. (*Apiaceae*) were examined using light and scanning electron microscopy. In this study we analyzed pollen morphology of the 15 currently recognized species of *Peucedanum* and examined how variations in key pollen characteristics relate to our current understanding of the taxonomy of this genus. We used principal components analysis to explore variations in pollen grain size (equatorial diameter and length) and shape (number of colpi) among *Peucedanum* species, and used cluster analysis to compare systematic groupings of *Peucedanum* based on floral, vegetative, and pollen characters. We compared these results with a previously published phylogeny based on molecular data. Groupings based on pollen characteristics alone did not align completely with those based on molecular or all morphological data.

First steps in project of reintroduction in natural habitat for *Tulipa sprengeri* (*Liliaceae*)

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Tulipa sprengeri (*Liliaceae*), common name as "yitik lâle" (means "missing tulip") in Turkish, is an endemic taxon that might had been grown naturally in the Middle Black Sea region, especially in Amasya, Tukey. Although it is still used as an ornamental plant in the World, there are only two herbarium records of this plant and it is considered Extinct in the Wild (EW, according to the IUCN categories) in Turkey.

A project for reintroduction in nature has been developed at the Nezahat Gökyiğit Botanic Garden (NGBB).

Yitik lale is included in plants protection projects of the Nezahat Gökyiğit Botanic Garden collections in 2015. For this purpose, we created an *ex–situ* conservation area in the central island of our garden. As part of the conservation project different seeds and bulbs propagation methods were assessed in the Bulbous Plant Collection Area. In dormancy studies, metric measurements were taken on hypocotyl, leaves and stem of 50 specimens and in morphological studies, metric measurements were taken on stem, leaf, flower, fruit, petiole and seed of 20 specimens. In order to compare these data, same phenological characterization will be done for the plants planted in Amasya according to their natural habitat.

Fruit micro-morphology of genus *Pimpinella* (*Apiaceae*) in Turkey

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The genus *Pimpinella* L. is a large genus of the family *Apiaceae* with c. 150 taxa mainly distributed through subtropical and temperate regions of the Northern hemisphere and the Mediterranean region. Turkey is one of the primary centers for *Pimpinella* genus along with African and Malagasy areas. 31 *Pimpinella* taxa occur in Turkey, including 26 species (8 endemics), 5 subspecies, and 4 varieties.

In this study, the fruit surface of 26 taxa of *Pimpinella* occurring in Turkey were examined using light and scanning electron microscopy. Fruit surface and trichomes surface were investigated. Fruit surface types are rugose, rugulose, ribbed-rugose, rugulose pusticulate, ruminate and smooth; trichomes surface types are puberulose, setulose, tuberculate, velutinous and hispid. These micromorphologic results are useful to identify and classify the different taxa of this genus. In addition, an identification key is provided according to micromorphology, general fruit characters and anatomic characters to better evaluate the similarities and relationships between taxa.

Notes on the taxonomy and distribution of *Cuscuta* (*Convolvulaceae*) in Turkey

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The genus *Cuscuta* (*Convolvulaceae*) contains ca. 200 holoparasitic species. This genus has an almost worldwide distribution it and is represented by 16 species in Turkey. Some of these species are among the most important groups of weeds, and they can cause major yield loss. The taxonomic circumscription of the genus is still controversial, and phylogenetic relationships of taxa in inter and intra-species level one poorly known.

A comprehensive study was carried out on morphology, seed and pollen micromorphology of the species occurring in Turkey. According to our results, the flowers segments contain calyx, corolla, stamen and pistil. The floral characters provide useful information for identification of the taxa, because their vegetative organs are reduced through their parasitic life. The most useful morphological character is the infrastaminal scales structure. This character is peculiar in *Cuscuta* and occurs in all the species occurring in Turkey.

The seed and pollen characters of 14 species of *Cuscuta* from Turkey have been studied using light and scanning electron microscops, to assess the significance of pollen and seed coat features as taxonomic characters. All examined species have 3-zonocolpate pollen types. Exine of pollen grains in all taxa has continuous transition from imperforate to small perforations.

The seed shape, measure, color and epidermal cell ornamentation differ between examined taxa. Two different shapes of outer periclinal cell wall are founded. Our results indicate that infrastaminal scales and seed micromorphology provide useful tools for identification of the taxa.

Les espèces endémiques, rares ou menacées de la tétraclinaie du Rif et des Béni-Snassèn (Maroc)

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Le Maroc, par sa position charnière entre les empires floristiques holarctiques et paléotropical, représente un territoire clé pour la migration et l'installation de nombreux taxons d'origine tropicale, en servant de refuge de flore thermophile lors des périodes glaciaires du Quaternaire.

Le Rif, massif montagneux situé à l'extrême nord du Maroc, a facilité la migration des espèces holarctiques. Ce vaste massif abrite à la fois des éléments méditerranéens, atlantiques et holarctiques, et plusieurs espèces y trouvent refuge et s'y localisent sans le dépasser. L'originalité de cette chaîne ainsi que celle du massif montagneux des Béni-Snassèn nous a poussé à inventorier le cortège floristique de leurs formations à base de thuya (*Tetraclinis articulata*) et à analyser leur diversité floristique, en mettant l'accent sur le statut, aux points de vue de l'endémisme et de la conservation, de chacun de ses représentants.

L'ensemble des plantes relevées comporte 9 espèces endémiques marocaines strictes, 20 espèces endémiques du territoire Maroc + Algérie, 11 endémiques du territoire Maroc + Algérie + Tunisie, 4 endémiques du territoire Maroc + Péninsule ibérique. Aussi, 16 espèces très rares (RR), 1 espèce soupçonnée très rare (RR ?), 5 espèces rares (R), 6 espèces soupçonnées rares (R ?), 1 espèce vulnérable (V) ont été identifiées.

Une attention particulière doit être portée à ces taxons afin d'éloigner le risque de leur extinction.

Sisyphos close to the mountain top: Euro+Med PlantBase is nearing its completion

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More than 15 years after the start, the Euro+Med PlantBase project (E+M), which aimed at providing a comprehensive, dynamic and permanently updated online checklist of all vascular plants for Europe and the Mediterranean countries, is now very close to full coverage. E+M is the most detailed resource on plant biodiversity in the Euro-Mediterranean area including the Caucasus, bridging the gap between less detailed global checklists on the one hand, and more heterogeneous floras and checklists on a regional or country level on the other hand. Originally, the database merged all the taxonomic and distributional information from the three largest botanical standard data sources for the region, i.e. from the ESFEDS database (derived from Flora Europaea), the published volumes of Med-Checklist, and the Flora of Macaronesia. Data from more than one hundred national and regional floras and checklists, and from several hundred articles and monographs, have been added to that basic dataset. New literature is regularly screened, critically evaluated and integrated by a network of editors, regional and taxonomic advisers and by the team at the E+M secretariat, which has been established at the Botanical Garden and Botanical Museum Berlin-Dahlem since 2004. Thus, the dynamic nature of the flora is reflected. As of 31st May 2016, the E+M website gives free access to more than 95% of the European, Mediterranean, Macaronesian and Caucasian taxa in 190 families with 2186 genera and a total of 40783 taxa (30280 species and 10503 subspecies, including the genera with very large numbers of apomictic microspecies such as *Alchemilla*, *Hieracium*, *Pilosella*, the *Ranunculus auricomus* aggregate, *Rubus* and *Taraxacum*). It is expected that editing and online publication of the remaining taxa will be complete by the end of 2016. E+M currently provides 43195 accepted names and an extensive synonymy (a total of 123540 names) with standardized and checked nomenclatural citations, misapplied names, orthographical variants, 144191 common names in 40 different languages, 238461 source-referenced distribution records for 40100 taxa, and literature-based distribution maps. The highest number of species so far has been recorded for Turkey, followed by Italy, Greece and Spain. Suprageneric classification follows "The Flowering Plant Families of the World" (Heywood & al. 2007); an update to a more recent classification system is being planned. E+M, together with Fauna Europaea and the European Register of Marine Species (ERMS), is one of the major contributors to the Pan-European Species-directories Infrastructure (PESI), which has been recommended as the preferred all-taxa inventory for European species.

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