XV INTERNATIONAL SEMINAR BIODIVERSITY MANAGEMENT AND CONSERVATION

"PLANT ECOLOGY AND CONSERVATION IN THE MEDITERRANEAN AREA"

LINGUAGLOSSA (CATANIA, ITALY)

2023, JUNE 6-10

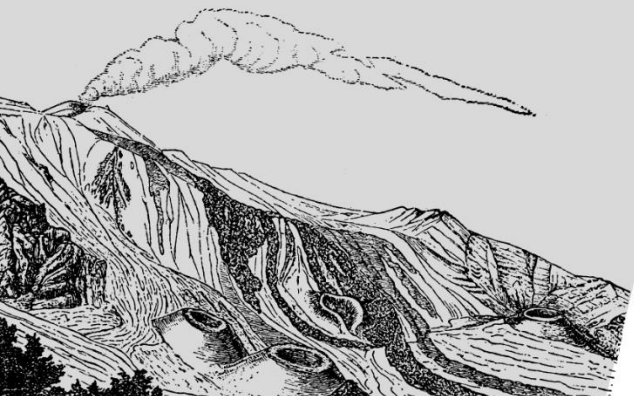
XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION

Plant ecology and conservation in the Mediterranean area

Uni ct

SICILIAE STVDIVM GENERALE 1434

Università di Catania



Book of Abstracts

XV INTERNATIONAL SEMINAR BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Book of abstracts

Linguaglossa (Etna, Italy) 2023, June 6-10
University of Catania, Italy.

Book of abstracts: Oral communications

Editors: Gian Pietro Giusso del Galdo, Saverio Sciandrello, Antonia Cristaudo, Pietro Minissale, Marta Puglisi, Veronica Ranno, Gianmarco Tavilla

Cover design: Veronica Ranno and Gianmarco Tavilla

Cover photo: Pietro Minissale

Logo iconography: Salvatore Brullo, *Betula etnensis* Raf.

How to cite this book: Giusso del Galdo G., Sciandrello S., Cristaudo A., Minissale P., Puglisi M., Ranno V., Tavilla G. (Eds.) 2023. XV INTERNATIONAL SEMINAR BIODIVERSITY MANAGEMENT AND CONSERVATION - "Plant ecology and conservation in the Mediterranean area". Book of abstracts. Linguaglossa (Etna, Italy) 2023, June 6-10. University of Catania Sicily, Italy.

How to cite an abstract: Authors A., Authors B., Authors C. (2023) Abstract title. Pp. Xx-Xx. In: Giusso del Galdo G., Sciandrello S., Cristaudo A., Minissale P., Puglisi M., Ranno V., Tavilla G. (Eds.) 2023. XV INTERNATIONAL SEMINAR BIODIVERSITY MANAGEMENT AND CONSERVATION - "Plant ecology and conservation in the Mediterranean area". Book of abstracts. Linguaglossa (Etna, Italy) 2023, June 6-10. University of Catania Sicily, Italy.

University of Catania (Italy)
Department of Biological, Geological and Environmental Sciences
Corso Italia, 55
95129, Catania

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Mediterranean Island Wetlands: distribution and ecology of aquatic vascular plants

Fois M. [1], Cuena-Lombraña A. [1], Attard V.[2], Cambria S.[3], Farrugia K.[2], Minissale P.[3], Pace A. [2], Tankovic E. [4], Bacchetta G. [1]*

[1] Biodiversity Conservation Centre, Department of Life and Environmental Sciences, University of Cagliari, Italy
[2] Nature Trust Malta, Wied Ghollieqa Environment Centre, Msida, Malta
[3] Department of Biological Geological and Environmental Sciences, University of Catania, Italy
[4] INITIATIVE PIM pour les Petites Iles de Méditerranée, Marseille, France

*Corresponding author: mfois@unica.it

Aquatic plants and, in particular, macrophytes (i.e., large enough to see with the naked eye) are generally defined as "aquatic photosynthetic organisms that actively grow permanently or periodically submerged below, floating on, or up through the water surface". This study presents the distribution and ecology of 299 aquatic vascular macrophytes reported for 1283 lentic wetlands in Sicily, Sardinia, Corsica, Malta and other surrounding smaller islands. All data are available online on the national MedIsWet geoportals (https://franceiswet.fr; https://www.maltawetlands.org; https://italiaiswet.it) and refer to both original field-recorded data and literature reports.
We used non-metric multidimensional scaling (NMDS) to visualize potential gradients in species composition between wetlands. Naturalness (natural/artificial) and type (coastal/inland) were the most important factors, while mean temperature in the warmest month, mean autumn precipitation and wetland conservation status were the main explanatory vectors. Accordingly, we examined the different plant traits among the following wetland categories: natural coastal wetlands, natural inland wetlands, and artificial wetlands. The largest percentage of species (38%) was ubiquitous among the three categories, while just 8% were found only in artificial wetlands. Of the species found only in the latter category, none were endemic and/or endangered, and most of them have a therophytic or hydrophytic life form. However, it is noteworthy that over 60% of the threatened species are ubiquitous (i.e. also present in the artificial ones).
This study provides the first comprehensive overview of the floristic composition of the Mediterranean islands' wetlands, offering snapshots of what is known and neglected to date. Among other information, these data confirm the low endemicity of wetland floras, which is validated by the poor influence of island origin as a factor in species composition. Although natural inland wetlands had already been denoted as crucial areas for biodiversity conservation, we highlighted the presence of several endangered macrophytes also in artificial wetlands.
Further investigations are needed to provide a more complete overview of the distribution, ecology, and interactions between wetland species, but this study represents a starting point for more informed wetland conservation in the future.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Zone umide delle isole del Mediterraneo: distribuzione ed ecologia delle piante vascolari acquatiche

Fois M. [1], Cuena-Lombraña A. [1], Attard V.[2], Cambria S.[3], Farrugia K.[2], Minissale P.[3], Pace A. [2], Tankovic E. [4], Bacchetta G. [1]*

[1] Biodiversity Conservation Centre, Department of Life and Environmental Sciences, University of Cagliari, Italy
[2] Nature Trust Malta, Wied Ghollieqa Environment Centre, Msida, Malta
[3] Department of Biological Geological and Environmental Sciences, University of Catania, Italy
[4] INITIATIVE PIM pour les Petites Iles de Méditerranée, Marseille, France

*Corresponding author: mfois@unica.it

Le piante acquatiche e, in particolare, le macrofite (cioè abbastanza grandi da poter essere viste a occhio nudo) sono generalmente definite come "organismi acquatici fotosintetici che crescono attivamente in modo permanente o periodico sommersi sotto, galleggianti o attraverso la superficie dell'acqua". Questo studio presenta la distribuzione e l'ecologia di 299 macrofite vascolari acquatiche segnalate per 1283 zone umide lentiche della Sicilia, Sardegna, Corsica, Malta e altre isole minori circostanti. Tutti i dati sono disponibili online sui geoportali nazionali MedIsWet (https://franceiswet.fr; https://www.maltawetlands.org; https://italiaiswet.it) e si riferiscono sia ai dati originali registrati sul campo sia alle segnalazioni riportati in letteratura.
Abbiamo utilizzato un multidimensional scaling non metrico (NMDS) per visualizzare i gradienti nella composizione delle specie tra le zone umide. La naturalità (naturale/artificiale) e la tipologia (costiera/interna) sono risultati i fattori più importanti, mentre la temperatura media del mese più caldo, le precipitazioni autunnali medie e lo stato di conservazione della zona umida sono stati i principali vettori esplicativi. Di conseguenza, abbiamo esaminato i diversi tratti vegetali tra le seguenti categorie: zone umide costiere naturali, zone umide interne naturali e zone umide artificiali. La percentuale maggiore di specie (38%) era ubiquitaria tra le tre categorie, mentre solo l'8% era presente soltanto nelle zone umide artificiali. Delle specie trovate solo in quest'ultima categoria, nessuna era endemica e/o in pericolo di estinzione e la maggior parte di esse erano terofite o idrofite. Tuttavia, è degno di nota il fatto che oltre il 60% delle specie minacciate sia ubiquitario (cioè presente anche nelle zone umide artificiali).
Questo studio fornisce una prima panoramica completa sulla composizione floristica delle zone umide delle isole del Mediterraneo, offrendo suggerimenti su ciò che è ad oggi noto o poco investigato. Tra le altre informazioni, si conferma la bassa endemicità delle flore delle zone umide, validata dalla scarsa influenza dell'isola di origine delle zone umide come fattore di composizione delle specie. Sebbene le zone umide naturali, soprattutto interne, fossero già state evidenziate come aree cruciali per la conservazione della biodiversità, abbiamo segnalato la presenza di diverse macrofite a rischio anche nelle zone umide artificiali.
Sono necessarie ulteriori indagini per fornire una panoramica più completa della distribuzione, dell'ecologia e delle interazioni tra le specie delle zone umide, ma questo studio rappresenta un punto di partenza per una futura conservazione più consapevole delle zone umide.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Salt marsh habitat analysis of the il-Ballut ta' Marsaxlokk Special Area of Conservation (Malta)

Tavilla G.[1], Lanfranco S.[2], Stevens D.T.[3], Henwood J.[3], Lamoliere A.[4], Ranno V.[1], Gabarretta J.[5], Attard V.[5], Adamo M.[6], Tomaselli V.[7]*

[1]Department of Biological, Geological and Environmental Sciences, University of Catania, Catania, Italy,
[2]Department of Biology, Faculty of Science, University of Malta, Msida, Malta.
[3]Environment and Resources Authority (ERA), Marsa, Malta
[4]Institute of Earth Systems, University of Malta, Msida, Malta
[5]Nature Trust-FEE Malta, Wied Gollieqa Environment Centre, Lower Level, Car Park 1, University of Malta, Malta
[6]National Research Council of Italy, Institute of Atmospheric Pollution Research (CNR-IIA) c/o Interateneo Physics Department, Bari, Italy
[7]Department of Biosciences, Biotechnologies and Environment, University of Bari "Aldo Moro", Bari, Italy

*Corresponding author: gtavilla@outlook.com

Malta is a small archipelago of Mediterranean islands with a relatively circumscribed natural environment. Due to its limited extent and many natural areas being degraded or destroyed to address its economy and rising population, its landmass resulted over developed. The Il-Ballut ta' Marsaxlokk Special Area of Conservation (SAC) is in the northeast corner of Marsaxlokk Bay (south-east of Malta). It was identified by Schembri et al. (1987) as a small but very important wetland of scientific interest, which supports halophilous plant communities and animals. Notwithstanding its naturalistic value, this area has faced several pressures in recent decades, such as human pressure and habitat loss. This requires a concrete assessment of the site's biodiversity. We provide salt marsh vegetation delineations for Il-Ballut ta' Marsaxlokk, through an object-based drone image analysis, landscape metrics and phytosociological surveys. This study is an example of a quantitative way to evaluate vegetation framework, with the goal of monitoring their dynamics.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Analisi del pantano salmastro dell'Area Speciale di Conservazione di Marsaxlokk (Malta)

Tavilla G.[1], Lanfranco S.[2], Stevens D.T.[3], Henwood J.[3], Lamoliere A.[4], Ranno V.[1], Gabarretta J.[5], Attard V.[5], Adamo M.[6], Tomaselli V.[7]*

[1]Department of Biological, Geological and Environmental Sciences, University of Catania, Catania, Italy,
[2]Department of Biology, Faculty of Science, University of Malta, Msida, Malta.
[3]Environment and Resources Authority (ERA), Marsa, Malta
[4]Institute of Earth Systems, University of Malta, Msida, Malta
[5]Nature Trust-FEE Malta, Wied Gollieqa Environment Centre, Lower Level, Car Park 1, University of Malta, Malta
[6]National Research Council of Italy, Institute of Atmospheric Pollution Research (CNR-IIA) c/o Interateneo Physics Department, Bari, Italy
[7]Department of Biosciences, Biotechnologies and Environment, University of Bari "Aldo Moro", Bari, Italy

*Corresponding author: gtavilla@outlook.com

Malta è un piccolo arcipelago di isole del Mediterraneo con un ambiente naturale relativamente circoscritto. A causa della sua estensione limitata e di molte aree naturali degradate o distrutte per far fronte alla sua economia e all'aumento della popolazione, il suo territorio risulta eccessivamente sviluppata. L'area speciale di conservazione (SAC) di Il-Ballut ta' Marsaxlokk si trova nella parte nord-est della baia di Marsaxlokk (a sud-est di Malta). È stato identificato da Schembri et al. (1987) come una piccola ma importantissima zona umida di interesse scientifico, che sostiene comunità vegetali e animali alofile. Nonostante il suo valore naturalistico, quest'area ha dovuto affrontare diverse pressioni negli ultimi decenni, come la pressione umana e la perdita di habitat. Ciò richiede una valutazione concreta della biodiversità del sito. Qui forniamo una valutazione della vegetazione del pantano di Il-Ballut ta' Marsaxlokk, attraverso un'analisi di immagini scattate con droni, metriche del paesaggio e indagini fitosociologiche. Questo studio è un esempio di un modo quantitativo per valutare la vegetazione con l'obiettivo di monitorarne la dinamica.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Invasiveness of the aquatic plant *Pistia stratiotes* can be modulated by population density

Stinca A.[1], D'Auria G.[2], Fiorentino N.[3], Ottaiano L.[3], Esposito A.[1]*

[1] Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania Luigi Vanvitelli, via Vivaldi 43, 81100 Caserta, Italy
[2] Servizio Fitosanitario, Regione Lazio, via del Serafico 107, 00142, Rome, Italy
[3] Department of Agriculture, University of Naples Federico II, via Università 100, 80055 Portici (Naples), Italy

*Corresponding author: adriano.stinca@unicampania.it

Pistia stratiotes L. (Araceae) is a free-floating freshwater macrophyte native to tropical and sub-tropical regions. In invaded areas, this alien plant can produce extensive mats with a high environmental impact on aquatic systems: reduction of dissolved oxygen concentrations, increase of evaporation rates in comparison with open water areas, increase of malaria vectors, and competition with native biodiversity. Water lettuce is considered one of the most emerging invasive alien hydrophytes in the Mediterranean Basin and it is included in the Alert List by European and Mediterranean Plant Protection Organization (EPPO). However, few studies deal with the ecological parameters which affect the biology and invasion strategies of this weed. In this study, combined effect of conspecific density (3, 6, 12, 24 plant/0.175 m2) and water salinity (0, 0.01, 0.05, 0.1% NaCl) on growth and reproductive strategies of *P. stratiotes* were analyzed by means of greenhouse experiments.
The growth rate of *P. stratiotes* was negatively affected by population density and salt concentration. A similar trend was evidenced in vegetative reproduction (number and length of stolons) that dramatically decreased in treatments with the higher plants density. As a consequence, N content in plant shoots showed a linear increasing trend associated to plant density with higher values recorded for higher plant densities. On the contrary, the production of inflorescences increases in the treatments with higher plants density. Data highlighted the effects of environmental conditions on reprodutive strategies of *P. stratiotes* suggesting an adaptative capability in modulating its high and very fast spread and invasiveness.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

L'invasività della pianta acquatica *Pistia stratiotes* può essere modulata dalla densità di popolazione

Stinca A.[1], D'Auria G.[2], Fiorentino N.[3], Ottaiano L.[3], Esposito A.[1]*

[1] Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania Luigi Vanvitelli, via Vivaldi 43, 81100 Caserta, Italy
[2] Servizio Fitosanitario, Regione Lazio, via del Serafico 107, 00142, Rome, Italy
[3] Department of Agriculture, University of Naples Federico II, via Università 100, 80055 Portici (Naples), Italy

*Corresponding author: adriano.stinca@unicampania.it

Pistia stratiotes L. (Araceae) è una macrofita d'acqua dolce originaria delle regioni tropicali e subtropicali. Nelle aree invase, questa pianta aliena può costituire popolamenti molto densi ed estesi con un elevato impatto ambientale sui sistemi acquatici: riduzione delle concentrazioni di ossigeno disciolto, aumento dei tassi di evaporazione, aumento dei vettori della malaria e competizione con la biodiversità nativa. La lattuga d'acqua è considerata una delle idrofite aliene invasive emergenti nel bacino del Mediterraneo ed è inclusa nell'elenco di allerta dall'Organizzazione europea e mediterranea per la protezione delle piante (EPPO). Tuttavia, pochi studi si sono occupati dei parametri ecologici che influenzano la biologia e le strategie di invasione di questa esotica.
In questo studio, mediante esperimenti in ambiente controllato, è stato analizzato l'effetto combinato della densità conspecifica (3, 6, 12, 24 piante/0,175 m^2) e della salinità dell'acqua (0, 0,01, 0,05, 0,1% NaCl) sulla crescita e sulle strategie riproduttive di *P. stratiotes*.
Il tasso di crescita di P. *stratiotes* è stato influenzato negativamente dalla densità di popolazione e dalla concentrazione di sale. Andamento simile è stato evidenziato nella riproduzione vegetativa (numero e lunghezza degli stoloni) che è diminuita drasticamente nei trattamenti con la maggiore densità di piante. Di conseguenza, il contenuto di N nelle piante ha mostrato una tendenza lineare all'aumento associata alla densità di popolazione, con valori più elevati registrati per densità delle piante più elevate. Al contrario, la produzione di infiorescenze è risultata maggiore nei trattamenti con maggiore densità di piante. Nel complesso i risultati ottenuti hanno evidenziato gli effetti delle condizioni ambientali sulle strategie riproduttive di *P. stratiotes* suggerendo una capacità adattativa nel modulare la sua elevata e rapidissima diffusione e invasività.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Management of invasive species in wetlands protected areas of the Natura 2000 network: case studies in Sardinia

Podda L. [1]*, *FoisM.* [2], *Cuena Lombrana A.* [2], *Mascia F.* [2], *Meloni F.* [2], *Bacchetta G.* [2]

[1]Sardinian Germplasm Bank (BG-SAR) - Hortus Botanicus Karalitanus (HBK), University of Cagliari (Italy).
[2]Centre for Conservation of Biodiversity (CCB) - Department of Life and Environmental Sciences, University of Cagliari (Italy).

*Corresponding author: lina.podda@gmail.com

Wetlands represent an important part of Europe's biodiversity. They provide ideal conditions for a wide variety of flora and fauna. However, despite their importance, wetlands are disappearing and among the most threatened ecosystems within the Natura 2000 network. Invasive alien species (IAS) are one of the main causes of biodiversity loss and species extinction and their spread is currently favoured by climate change and globalisation, which in parallel reduces the resilience of endangered habitats like wetlands.
Molentargius salt marshes and Santa Gilla lagoon are the most important wetlands in southern Sardinia and among the largest ecosystems of natural wetlands in Europe. They are located in urban contexts and on the outskirts of the city of Cagliari and they have been historically modified and used by humans. Nonetheless, they are still conserving relevant aspects, in terms of habitats and species and they are recognized for their conservation importance by the Ramsar Convention and protected by different regional (Molentargius-Saline Regional Park), national and international policies (two SACs: "Stagno di Molentargius e territori limitrofi" and "Stagno di Cagliari, Saline di Macchiareddu, Laguna di Santa Gilla"; two SPAs: "Saline di Molentargius" and "Stagno di Cagliari").
In recent years, the two wetlands have been affected by several projects concerning actions aimed at eradicating and controlling IAS. These projects were financed by the managing authority of the protected areas with own and regional funds (Molentargius-Saline Regional Park) and by European funds within the Prioritized Action Frameworks (PAFs) to implement the EU-wide Natura 2000 network (action 6.5.1 POR FESR 2014-2020) (Metropolitan City of Cagliari).
Eradication and control of IAS were necessary to give back space to native species, to support the recovery of natural vegetation, and also facilitate, wherever the eradication took place, the reintroduction of native species through renaturation of wetland areas. The eradication actions were performed only by expert and authorized staff, since IAS are inside natural and sensitive habitats, to avoid harming native animal and plant species. Both hand and mechanical eradication practices were carried out and, at the same time, their effectiveness was monitored. An economic estimate was also made to evaluate the work effort in terms of number of workers, tools used and time consuming for eradication.
The results obtained are important from an application point of view because they provide useful information for the conservation of autochthonous species and natural habitats and for the management of IAS in wetlands.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Gestione delle specie invasive nelle zone umide della rete Natura 2000: casi studio in Sardegna

Podda L. [1]*, *FoisM.* [2], *Cuena Lombrana A.* [2], *Mascia F.* [2], *Meloni F.* [2], *Bacchetta G.* [2]

[1]Sardinian Germplasm Bank (BG-SAR) - Hortus Botanicus Karalitanus (HBK), University of Cagliari (Italy).
[2]Centre for Conservation of Biodiversity (CCB) - Department of Life and Environmental Sciences, University of Cagliari (Italy).

*Corresponding author: lina.podda@gmail.com

Le zone umide rappresentano una parte importante della biodiversità in Europa. Costituiscono l'ambiente ideale per un'ampia varietà di specie animali e vegetali. Tuttavia, nonostante la loro importanza, le zone umide stanno scomparendo e sono tra gli ecosistemi più minacciati all'interno della rete Natura 2000. Le specie aliene invasive (IAS), complici i cambiamenti climatici in atto, sono una delle maggiori cause di perdita di biodiversità e di estinzione delle specie. I cambiamenti climatici facilitano la diffusione e l'insediamento di molte specie aliene e riducono la resilienza di habitat a rischio come le zone umide.
Lo stagno di Molentargius e lo stagno di Cagliari - Santa Gilla sono le zone umide più importanti del sud Sardegna e tra i più grandi sistemi di zone umide naturali d'Europa. Si trovano entrambi in contesti urbani e alle porte della città di Cagliari e hanno subito storicamente numerose modificazioni, pur conservando aspetti rilevanti, in termini di habitat e specie. Infatti, per la loro importanza conservazionistica sono zone umide riconosciute dalla Convenzione di Ramsar e sottoposte a diversi regimi di tutela di tipo regionale (Parco Naturale Regionale Molentargius-Saline), nazionale e internazionale (due ZSC: "Stagno di Molentargius e territori limitrofi" e "Stagno di Cagliari, Saline di Macchiareddu, Laguna di Santa Gilla"; due ZPS: "Saline di Molentargius" e "Stagno di Cagliari"). Negli ultimi anni le due zone umide sono state interessate da diversi progetti riguardanti azioni dirette a eliminare la minaccia delle specie aliene invasive. Questi progetti sono stati finanziati dagli Enti gestori delle aree protette attraverso fondi propri e regionali (Parco di Molentargius) e i Prioritized Action Framework (PAF) per i Piani di Gestione della Rete Natura 2000 (azione 6.5.1 del POR FESR 2014-2020) (Città Metropolitana di Cagliari).
Gli interventi di controllo e/o di eradicazione delle specie invasive sono stati necessari per ridare spazio alle specie autoctone, favorire la ripresa della vegetazione spontanea e per facilitare, dove è stata effettuata l'eradicazione, anche la possibile reintroduzione di specie native con interventi di rinaturazione. Gli interventi di eradicazione sono stati eseguiti solo da personale esperto e autorizzato, in quanto le piante invasive si trovano all'interno di habitat naturali e sensibili come le zone umide e per non danneggiare le specie native, sia animali che vegetali. Sono state realizzate diverse pratiche di eradicazione sia manuali che meccaniche e contestualmente sono state monitorate le attività, nonché l'efficacia degli interventi. Inoltre, è stata effettuata una stima economica valutando lo sforzo del lavoro degli interventi considerando il numero di persone, i mezzi utilizzati e il tempo necessario per l'eradicazione.
I risultati ottenuti sono importanti dal punto di vista applicativo perché forniscono informazioni utili sia per la conservazione delle specie autoctone e degli habitat naturali che per la gestione delle IAS nelle zone umide.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Wetland Restoration within the Natura 2000 site of Kemmuna

Gatt J., Saliba S.*

Environment & Resources Authority, Malta

*Corresponding author: jurgen.a.gatt@era.org.mt

The Environment and Resources Authority (ERA) is the competent authority for regulating the management of protected areas in Malta in line with the Habitats Directive and the Birds Directive. Back in December 2021, ERA collaborated with PAP/RAC (Priority Actions Programme/Regional Activity Centre), one of the components of UNEP Mediterranean Action Plan, based in Split, Croatia. The collaboration was intended to develop a Restoration Plan for one coastal wetland, in the frame of the UNEP small project under the UN Decade on Ecosystem restoration, financed by the modest SIDA funds. The timeframe allocated for this project was nine months with a budget of around ten thousand euros.
The Restoration Plan aimed at restoring the habitat of wetland habitat lost due to incompatible practices on the Natura 2000 island of Kemmuna, forming part of the Maltese Archipelago, and BirdLife Malta together with experts from the University of Malta developed the plan. The final Restoration Plan included the following:
Plan aimed at restoring and enlarging the extant wetland area;
Restoration actions for the structure and function of Mediterranean and thermo-Atlantic halophilous scrubs;
Plan for the removal of invasive species;
Recommendations on what indigenous species can be planted, augmented or reintroduced;
Recommendations on what habitat restoration and engineering interventions are needed
Extension of the wetland and respective increased habitat coverage, through an understanding of the hydro-dynamics of the area;
Recommendations for interventions required to establish the area as a refuge for avifauna.
Following the finalization of the Restoration Plan in June 2022, ERA in collaboration with a national entity (Ambjent Malta) started implementing the preliminary interventions. The project included the mechanical removal of invasive alien species, engineering works and planting of indigenous trees and plants.
Future planned works will focus on reintroduction of typical species and establishing a managing framework to safeguard the conservation of this habitat.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Restawr ta' Art Mistagħdra fi sit ta' Natura 2000 ta' Kemmuna

Gatt J., Saliba S.*

Environment & Resources Authority, Malta

*Corresponding author: jurgen.a.gatt@era.org.mt

L-Awtorità għall-Ambjent u r-Riżorsi (ERA) hija l-awtorità kompetenti biex tirregola iż-żoni protetti f'Malta skont id-Direttiva tal-Ambjent u d-Direttiva tal-Għasafar. Lura f'Diċembru 2021, l-ERA kkollaborat ma' PAP/RAC (Programm ta' Azzjonijiet Prijoritarji/Ċentru ta' Attività Reġjonali), parti mill-Pjan ta' Azzjoni Mediterranju tal-UNEP, ibbażat fi Split, il-Kroazja. Il-kollaborazzjoni kienet maħsuba biex tiżviluppa Pjan ta' Restawr għal art mistagħdra kostali, fil-qafas tal-proġett tal-UNEP taħt UN Decade fuq restawr tal-ekosistemi, iffinanzjat mill-fondi SIDA. Iż-żmien allokat għal dan il-proġett kien ta' disa' xhur b'baġit ta' madwar għaxart elef ewro.

Il-Pjan ta' Restawr immira li jsir restawr tal-ambjenti naturali tal-art mistagħdra mitlufa minħabba prattiċi inkompatibbli fil-gżira ta' Natura 2000 ta' Kemmuna, li tifforma parti mill-Arċipelagu Malti. Il-BirdLife Malta flimkien ma' esperti mill-Università ta' Malta żviluppaw dan il-pjan u il-Pjan ta' Restawr finali kien jinkludi dan li ġej:

Pjan immirat lejn ir-restawr u t-tkabbir taż-żona mistagħdra eżistenti;
Azzjonijiet ta' restawr għall-istruttura u l-funzjoni ta' ambjenti naturali tipiċi;
Pjan għat-tneħħija ta' speċi invażivi;
Rakkomandazzjonijiet dwar liema speċi indiġeni jistgħu jiġu mħawla jew introdotti mill-ġdid;
Rakkomandazzjonijiet dwar liema interventi ta' restawr tal-ambjenti naturali u ta' inġinerija huma meħtieġa;
Estensjoni tal-art mistagħdra u żieda rispettiva fil-kopertura tal-ħabitat;
Rakkomandazzjonijiet għal interventi meħtieġa biex iż-żona tiġi stabbilita bħala kenn għall-għasafar.

Wara l-finalizzazzjoni tal-Pjan ta' Restawr f'Ġunju 2022, l-ERA b'kollaborazzjoni ma' entità nazzjonali (Ambjent Malta) bdiet timplimenta l-interventi preliminari. Il-proġett kien jinkludi t-tneħħija mekkanika ta' speċi aljeni invażivi, xogħlijiet ta' inġinerija u tħawwil ta' siġar u pjanti indiġeni.

Ix-xogħlijiet ippjanati fil-futur se jiffokaw fuq l-introduzzjoni mill-ġdid ta' speċi tipiċi u l-istabbiliment ta' qafas ta' ġestjoni biex tiġi salvagwardjata l-konservazzjoni ta' dan l-ambjent.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Typology and mapping of saltmash vegetation of the Noyalo River (Morbihan, Bretagne)

Chevrollier C., Bioret F., Glemarec E.*

Laboratoire Géoarchitecture, Université de Bretagne occidentale, Brest, France

*Corresponding author: corentinchevrollier56@gmail.com

Located in the southern part of Golfe du Morbihan, Noyalo river is fringed by natural salt marshes historically grazed and semi-natural salt marshes corresponding to ancient salt pans that are nowadays abandoned. Right bank of this little coastal estuary is protected as it is integrated within the national nature Reserve of Séné marshes. Within the context of extension of this reserve, salt marsh vegetation of both banks has been mapped in 2021 and 2022, from 2019 high resolution orthophotographs. 93 phytosociological relevés have been realized following the sigmatist method (Géhu, 1987, Géhu & Rivas-Martínez, 1981); their analysis has allowed the identification of 39 saltmarshes syntaxa distributed in 8 phytosociological Classes: *Spartinetea glabrae* (2), *Asteretea tripolii* (11), *Salicornietea fruticosae* (5), *Thero-Suaedetea splendentis* (8), *Cakiletea maritimae* (3), *Ruppietea maritimae* (1), *Agropyretea pungentis* (4), *Phragmiti australis-Magnocaricetea elatae* (5). In addition, about 5400 GPS points, with sub-metric precision, have been realized, to localize association individual. This GPS points database will be allowing to facilitate extrapolation for realizing vegetation map under QGIS software. For polygon limits, orthophotographs has been segmented. This algorithmic technic of image treatment allows to automatically individualize homogeneous areas. Such obtained segments form a base for creating finely delimited polygons.
This method allowed notably to clearly distinguish two vegetation types colonizing the high slikke and respectively dominated by:
- *Spartina maritima*, European native marsh grass (*Spartinetum maritimae*);
- *Spartina anglica*, fertile hybrid between S. maritima and S. alterniflora) (*Spartinetum anglicae*) which tends to replace Spartina maritima.
It has been also possible to localise precisely some plant associations with limited spatial extension and often distributed in mosaic with other vegetation, like *Puccinellio maritimae-Salicornietum emerici* in micropounds of high shore. From phytosociological map, a map of Habitats of community interest can be produced (generic and elementary Habitats). Several synrelevés are realized for each functional salt marsh unit: they describe the phytocoenotic richness, abundance dominance and spatial occupation of each syntaxa. Thanks to its high phytocoenotic diversity due to the presence of a salinity gradient and a good conservation status of habitats, the Noyalo River is one of the richest sites of saltmarshes of the French Atlantic coast (Géhu, 1979). A diachronic analysis of the saltmarsh vegetation evolution will be undertaken from 5 vegetation maps realized since four decades; it will be completed by former phytosociological data (Géhu, 1979). This phytosociological inventory and mapping will allow to establish a state of reference for long term monitoring of the impacts of sea level rise and global change on the phytocoenodiversity of this site.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Typologie et cartographie des végétations de prés salés de la Rivière de Noyalo (Morbihan, Bretagne)

Chevrollier C., Bioret F., Glemarec E.*

Laboratoire Géoarchitecture, Université de Bretagne occidentale, Brest, France

*Corresponding author: corentinchevrollier56@gmail.com

Située au sud du Golfe du Morbihan, la Rivière de Noyalo est bordée par des étendues de prés salés naturels autrefois pâturés et de prés salés semi-naturels correspondant à d'anciens marais salants aujourd'hui abandonnés. La rive droite de ce petit estuaire côtier est protégée car intégrée dans le périmètre de la Réserve naturelle nationale des marais de Séné. Dans le cadre du projet d'extension de cette réserve, la végétation de prés salés des deux rives a été cartographiée en 2021 et 2022, à partir d'orthophotographies de 2019 en haute résolution. Sur le terrain, 93 relevés phytosociologiques ont été effectués suivant la méthode sigmatiste (Géhu, 1987, Géhu & Rivas-Martínez, 1981); leur analyse a permis d'identifier 39 syntaxons de prés salés, répartis dans 8 classes phytosociologiques : Spartinetea glabrae (2), Asteretea tripolii (11), Salicornietea fruticosae (5), Thero-Suaedetea splendentis (8), Cakiletea maritimae (3), Ruppietea maritimae (1), Agropyretea pungentis (4), Phragmiti australis-Magnocaricetea elatae (5). En complément des relevés phytosociologiques, 5400 points GPS, d'une précision sub-métrique ont été réalisés pour localiser les individus d'associations. Cette banque de points GPS a ensuite permis de faciliter l'extrapolation lors de la réalisation de la cartographie sur le logiciel QGIS. Pour le tracé des polygones, l'orthophotographie a été segmentée. Cette technique algorithmique de traitement de l'image permet d'individualiser automatiquement des zones homogènes automatiquement. Les segments obtenus constituent une base pour créer des polygones aux contours fins et précis.
Cette méthode a notamment permis de distinguer clairement les deux types de végétation qui colonisent la haute slikke et dominées respectivement par:
- Spartina maritima, spartine européenne native (Spartinetum maritimae)
- Spartina anglica, hybride fertile entre S. maritima et S. alterniflora) (Spartinetum anglicae) qui a tendance à supplanter Spartina maritima.
Il a également été possible de d'identifier individuellement certaines associations végétales à faible étendue spatiale et le plus souvent en mosaïque avec d'autres végétations, comme le Puccinellio maritimae-Salicornietum emerici des microcuvettes du haut schorre. À partir de la cartographie phytosociologique, une cartographie des Habitats d'intérêt communautaire est produite (Habitats génériques et habitats élémentaires). Parallèlement, plusieurs synrelevés ont été effectués pour chaque unité fonctionnelle de prés salés : ils renseignent la richesse phytocoenotique, l'abondance dominance et l'occupation spatiale de chaque syntaxon. En raison de sa grande diversité phytocoenotique, dûe à un gradient de salinité et du bon état de conservation des habitats, la rivière de Noyalo est considérée comme l'un des sites de prés salés les plus riches de la façade atlantique française (Géhu, 1979). Une analyse diachronique de l'évolution des végétations de prés salés sera menée à partir de 5 cartographies de végétation réalisées depuis quatre décennies, et sera complétée par des données phytosociologiques anciennes (Géhu, 1979). Ces travaux d'inventaire et de cartographie phytosociologiques permettent d'établir un état de référence pour les suivis à long terme de l'impact de l'élévation du niveau de la mer et des changements globaux sur la phytocoenodiversité de ce site.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Phytodiversity of wetlands in Algeria: Synthesis and conservation

Kadid Y. [1,2]*, *Siab-Farsi B.* [1,2], *Bouzahar C.* [1,2]

[1]Laboratoire de Conservation, Gestion et Amélioration des Ecosystèmes Forestiers
[2]Ecole Nationale Supérieure Agronomique. Alger

*Corresponding author: yamina.kadid@edu.ensa.dz

The present work aims at the knowledge of the aquatic vegetation of the wetlands in Algeria. Eastern Numidia offers particular ecological conditions, where various lakes, lagoons, marshes and swamps constitute favourable habitats for the development of hydrophytes and helophytes, forming original and diversified plant associations. This work presents the synthesis of several studies carried out in order to describe and understand the organization, structure and diversity of plant communities in the wetlands of eastern Numidia. Several criteria for evaluating the flora have been put in place. For this study, we use quantitative indices such as species richness and qualitative indices such as rarity, endemism, biogeographic origin and biological types. For the study of vegetation, sampling is carried out according to the sigmatist method based on taking vegetation readings on homogeneous surfaces on the physiognomic, floristic and ecological levels. The phytosociological analysis was carried out using the techniques of the sigmatist method from floristic surveys carried out using the transect technique. The phytosociological method is also used for the identification and classification of existing plant communities. From these analyses, it is clear that the wetlands of eastern Numidia have a great taxonomic richness. They alone account for 92% of families, 75% of genera and 74.4% of recent species throughout Numidia. These figures show that Eastern Numidia conceals a high floristic richness. From these observations, it is clear that these wetlands contain an undeniable phytocenotic and floristic capital, attesting to their high heritage value and their biological richness. This work constitutes a first synthesis of the work carried out on the flora of the wetlands of eastern Numidia and Algeria. The results of the phytosociological analysis revealed 10 syntaxa considered rare, of high heritage value and threatened, requiring special protection measures. Their preservation will ensure the sustainability of the biological diversity and the potential of the wetlands of eastern Numidia.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Phytodiversite des zones humides en Algerie: essai de synthese et conservation

Kadid Y. [1,2]*, *Siab-Farsi B.* [1,2], *Bouzahar C.* [1,2]

[1]Laboratoire de Conservation, Gestion et Amélioration des Ecosystèmes Forestiers
[2]Ecole Nationale Supérieure Agronomique. Alger

*Corresponding author: yamina.kadid@edu.ensa.dz

Le présent travail vise la connaissance des végétations aquatiques des zones humides en Algérie. La Numidie orientale offre des conditions écologiques particulières, où divers lacs, lagune, marais et marécages constituent des habitats favorables au développement d'hydrophytes et hélophytes, formant des associations végétales originales et diversifiées. Ce travail présente la synthèse de plusieurs études menées afin de décrire et comprendre l'organisation, la structure et la diversité des communautés végétales des zones humides la Numidie orientale. Plusieurs critères d'évaluation de la flore ont été mis en place, Pour cette étude, nous utilisons des indices quantitatifs tels la richesse spécifique et des indices qualitatifs tels la rareté, l'endémisme, l'origine biogéographique et les types biologiques. Pour l'étude de la végétation, l'échantillonnage est réalisé selon la méthode sigmatiste basée sur la prise de relevés de végétation sur des surfaces homogènes sur les plans physionomique, floristique et écologique. L'analyse phytosociologique a été menée selon les techniques de la méthode sigmatiste à partir de relevés floristiques réalisés selon la technique des transects. La méthode phytosociologique est de même utilisée pour l'identification et la classification des communautés végétales existantes. De ces analyses, il ressort clairement que les zones humides de la Numidie orientale présentent une grande richesse taxonomique. Elles totalisent à elles seules 92% des familles, 75% des genres et 74,4% des espèces récences dans toute la Numidie. Ces chiffres montrent que la Numidie orientale recèle une haute richesse floristique. De ces observations, il ressort clairement que ces zones humides recèlent un capital phytocénotique et floristique incontestable, attestant de leur haute valeur patrimoniale et de leur richesse biologique. Le présent travail constitue une première synthèse des travaux menés sur la flore des zones humides de la Numidie orientale et de l'Algérie. Les résultats de l'analyse phytosociologique ont fait ressortir 10 syntaxons considérés comme rares, de haute valeur patrimoniale et menacés, nécessitants des mesures de protection particulière. Leur préservation assurera la pérennité de la diversité biologique et les potentialités des zones humides de la Numidie orientale.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Evaluation of carbon sequestration and growth modeling of zeen oak stands (*Quercus canariensis* Willd) in the forests of Akfadou and Beni Ghobri (wilaya of Tizi Ouzou), Algeria

Assia M. [1,2,3]*, *Bourrai Y.* [1,2,3]

[1]Ecole Nationale Agronomique (El harrach à ALGER)
[2]Département de Foresterie et protection de la nature
[3]Laboratoire de recherche en Conservation, Gestion et Amélioration des Ecosystèmes Forestiers

*Corresponding author: assia.mokhtari@edu.ensa.dz

The objective of the present study is to evaluate carbon sequestration and growth modelling of two zeen oak forests (*Quercus canariensis* Willd), Akfadou and Ath Ghobri.
The analysis of the data we have done are the growth modelling, the volume calculation and the amount of carbon sequestered by each station.
The results obtained show that carbon sequestration by zeen oak is influenced by the factors studied, which are tree growth (in height and in diameter, or circumference), wood production (volume) and stand density.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Evaluation de la séquestration du carbone et modélisation de croissance des peuplements de chêne zeen (*Quercus canariensis* Willd) dans les forêts d'Akfadou et de Beni Ghobri (wilaya de Tizi Ouzou), Alegerie

Assia M. [1,2,3]*, *Bourrai Y.* [1,2,3]

[1]Ecole Nationale Agronomique (El harrach à ALGER)
[2]Département de Foresterie et protection de la nature
[3]Laboratoire de recherche en Conservation, Gestion et Amélioration des Ecosystèmes Forestiers

*Corresponding author: assia.mokhtari@edu.ensa.dz

L'étude a pour objectif l'évaluation de la séquestration de carbone et la modélisation de croissance au niveau de deux forêts de chêne zeen (*Quercus canariensis* Willd) de la grande la Kabylie, qui sont l'Akfadou et Ath Ghobri. L'analyse des données que nous avons effectuées sont la modélisation de la croissance, le calcul du volume et la quantité de carbone séquestrée par chaque station. Les résultats obtenus montrent que la séquestration de carbone par le chêne zeen est influencée par les facteurs étudiés qui sont la croissance des arbres (en hauteur et en diamètre, ou circonférence), la production du bois (volume) et la densité du peuplement.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

New chemical insights in industrial hemp and its by-products

Formato M., Piccolella S., Pacifico S.*

Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania ''Luigi Vanvitelli'', Via Vivaldi 43, 81100 Caserta, (Italy).

* Corresponding author: marialuisa.formato@unicampania.it

Hemp (*Cannabis sativa* L. subsp. *sativa*) has long been considered a multi-purpose crop, with applications in fiber, food, and medicinal fields. Recently, the long period defined by the prohibition of hemp production has given the way to its re-evaluation in various industrial sectors. In particular, as regards the food sector, hemp seeds, and food products and supplements therefrom have been recently claimed for their potential nutritional and functional support for the human organism, as they share, apart from essential constituents for human nutrition, several bioactive specialized metabolites (Crescente et al., 2018). Moreover, the possibility to exploit also other plant organs, considered as wastes from the seed processing and transformation, for the recovery of functional compounds could really provide the basis for the development of enriched and stable nutraceutical products. This consideration opens up new perspectives on the production of goods with high-added value with sustainability, recycling, and reuse as driving forces.
Herein, starting from our previous investigations on the phytochemistry of hemp plants from the Campania Region (Italy) and the richness in phenols and polyphenols (Faugno et al, 2019; Moccia et al., 2019; Nigro et al., 2020), beyond phytocannabinoids, the analysis of the chemical composition of different plant parts, resulting as a waste of seed production after its harvesting (e.g., stem fibrous outer part, leaves, their trimming waste, and hemp pollen) was of interest for their renewable use in a hemp polyphenol recovery goal. In particular, all waste materials underwent ultrasound-assisted maceration using ethanol as the extractive solvent. The alcoholic extracts were further fractionated through SiO_2-CC using sequentially *n*-hexane, ethyl acetate, and methanol. Then, a deep chemical investigation of the methanol fractions was carried out by means of UHPLC-HRMS/MS to investigate their phenol and polyphenols constituents. The results suggested that hemp leaf waste was an interesting source of hydroxycinnamoyl quinic acid and aldonic acid depsides, whereas flavonoid *O*- and *C*-glycosides and glucuronides derivatives were particularly abundant in leaf and stem waste materials, together with phenylamides. In order to light up the intrinsic antioxidant propriety of hemp constituents, all methanol fractions were also evaluated for their antiradical activity, by means DPPH$^{\bullet}$ and ABTS$^{\bullet+}$ tests, and reducing power by ferricyanide FRAP assay (Formato et al., 2023).

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Nuove conoscenze chimiche sulla canapa industriale e i suoi sottoprodotti

Formato M., Piccolella S., Pacifico S.*

Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania ''Luigi Vanvitelli'', Via Vivaldi 43, 81100 Caserta, (Italy).

* Corresponding author: marialuisa.formato@unicampania.it

La canapa (*Cannabis sativa* L. subsp. *sativa*) è da tempo considerata una coltivazione polivalente sia per la sua fibra che per le applicazioni in campo alimentare e medicinale. Di recente, dopo un lungo periodo di divieto della sua coltivazione, la canapa è stata rivalutata in diversi settori industriali. In particolare, in campo alimentare i semi di canapa, così come i prodotti alimentari e gli integratori da essi derivati, sono stati valorizzati per il loro potenziale apporto nutrizionale e funzionale all'organismo umano, in quanto oltre a contenere costituenti essenziali, sono ricchi di diversi metaboliti specializzati bioattivi (Crescente et al., 2018). Inoltre, la possibilità di recuperare composti funzionali sfruttando altri organi della pianta che costituiscono scarti di lavorazione e trasformazione della filiera che vede il seme come attore principale, potrebbe fornire la base per lo sviluppo di nuovi prodotti nutraceutici ad alto valore aggiunto, puntando alla sostenibilità, al riciclo e al riuso.
A tal proposito, considerando i precedenti studi sulla fitochimica della pianta di canapa coltivata nella Regione Campania (Italia) ed in particolare la ricchezza in fenoli e polifenoli oltre ai fitocannabinoidi (Faugno et al, 2019; Moccia et al., 2019; Nigro et al., 2020), in questo lavoro ci si è focalizzati sull'analisi della composizione chimica di diverse parti della pianta, ottenute dagli scarti di produzione dei semi dopo la raccolta (ad esempio, la parte esterna fibrosa del fusto, le foglie, gli scarti di trimmatura e il polline), in un'ottica di pieno recupero dei polifenoli da canapa.
Tutti i materiali vegetali di scarto sono stati sottoposti a macerazione assistita da ultrasuoni utilizzando l'etanolo come solvente estraente. Gli estratti alcolici sono stati poi ulteriormente frazionati attraverso SiO_2-CC utilizzando come solventi eluenti *n*-esano, acetato di etile e metanolo. Le frazioni metanoliche così ottenute sono state analizzate approfonditamente mediante UHPLC-HRMS/MS focalizzate sull'identificazione di costituenti fenolici e polifenolici. I risultati hanno suggerito che gli scarti delle foglie di canapa sono una significativa fonte di acido idrossicinnamoilchinico e di depsidi dell'acido aldonico, mentre i derivati *O*- e *C*-glicosidici e i glucuronidici dei flavonoidi sono particolarmente abbondanti nelle foglie e negli steli, insieme con metaboliti a scheletro fenilammidico. Al fine di evidenziare le proprietà antiossidanti intrinseche dei costituenti della canapa, tutte le frazioni metanoliche sono state altresì sottoposte a test di valutazione dell'attività antiradicalica nei confronti di $DPPH^{\bullet}$ e $ABTS^{\bullet+}$, e del potere riducente mediante saggio FRAP (Formato et al., 2023).

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

The endemic *Lavandula austroapennina* N.G. Passal., Tundis & Upson: phytochemical investigations to promote and enhance its polar bioactive resource

Gravina C. *, Piccolella S., Stinca A., Pacifico S., Esposito A.

Department of Environmental Biological and Pharmaceutical Sciences and Technologies, University of Campania Luigi Vanvitelli, Via Vivaldi 43, 81100 Caserta, Italy.

*Corresponding author: claudia.gravina@unicampania.it

Medicinal and aromatic plants (MAPs) have been used extensively for health care and healing practices throughout history and in different cultures, providing a natural remedy that has been perfected over generations. Today, hundreds of MAPs are still cultivated worldwide to obtain active ingredients, which are specialized metabolites with important antimicrobial, anti-inflammatory, antioxidant and antiproliferative properties (Salmerón-Manzano et al., 2020). MAPs processing can be an effective way not only to promote knowledge of local history and traditions, but also to improve the evidence of their beneficial effects, allowing their definition as functional goodness. Among MAPs, the members of the Lamiaceae family have a long-lasting popularity thanks above all to their essential oils, which have multiple applications in medicine, cosmetics, gastronomy and aromatherapy. In particular, the genus Lavandula stands out for its traditional application in the treatment of depression, headache, stress, migraine and diabetes (Salehi et al., 2018) and for the recent awareness of the possibility of recovering non-volatile bioactives from several species of the genus (e.g. *L. angustifolia*, *L. stoechas*, *L. peduncolata*) (Dobros et al., 2023). In the southern Apennines, investigating the population of *L. angustifolia*, Upson & Andrews recognized a new endemic species, restricted to calcareous rocky habitats from 900 to 1750 m asl, which was called *L. austroapennina* N.G.Passal., Upson & Tundis (Upson & Andrews, 2004). This species, known locally as "*spicaddossa*" due to the soothing and disinfectant effects deriving from the rubbing of its leaves, has a long ethnobotanical tradition that has been lost over time and its essential oils were the basis of a precious Italian-French perfumery supply chain. The great past interest in its local use and the renewed awareness of the benefits of natural products make it necessary to study the phytochemical and biological features of *L. austroapennina* in order to promote and enhance its new use. For this purpose, the plant was collected on Monte Cervati (Cilento National Park, Vallo di Diano and Alburni) and dissected into its various organs (corolla, calyx, leaf, stem and roots) which were subjected to sequential ultrasound extraction in *n*-hexane and methanol, for a complete recovery of the polyphenols. The UHPLC-HR-MS/MS tools were used to get insights into the chemical profile of each organ, whose antioxidant, anti-radical and reducing activity was carried out using the ABTS, DPPH and PFRAP tests. Finally, to enable a fruitful application in the cosmeceutical field, the extracts were screened for their cytotoxicity on the human keratinocyte HaCaT cell line and the healing properties were analyzed by scratch test. Polyphenols appeared specifically distributed in the different organs, with glycosylated and acylated flavonoids mainly present in the corolla, and derivatives of hydroxycinnamic acids and of 8-hydroxy phenylpropanoic acids in the hypogeal organs. The data on antiradical and reducing efficacy, as well as the definition of the cytotoxicity profile underline that, in addition to the corolla, which has found use for obtaining essential oils, other organs also show promising activities, thus suggesting further investigations for the full recovery of this local resource.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Studio fitochimico della frazione polare della specie endemica *Lavandula austroapennina* N.G. Passal., Tundis & Upson: risorsa da promuovere e valorizzare

*Gravina C. *, Piccolella S., Stinca A., Pacifico S., Esposito A.*

Department of Environmental Biological and Pharmaceutical Sciences and Technologies, University of Campania Luigi Vanvitelli, Via Vivaldi 43, 81100 Caserta, Italy.

*Corresponding author: claudia.gravina@unicampania.it

Le piante medicinali e aromatiche (PAM) sono state ampiamente utilizzate per scopi salutistici e curativi nel corso della storia e in diverse culture, fornendo un rimedio naturale che è stato perfezionato nel proseguire delle generazioni. Oggi, centinaia di PAM sono coltivate in tutto il mondo per ottenere principi attivi, ovvero metaboliti specializzati con importanti proprietà antimicrobiche, antinfiammatorie, antiossidanti e antiproliferative (Salmerón-Manzano et al., 2020). La lavorazione di PAM può rappresentare un modo efficace non solo per promuovere la conoscenza della storia e delle tradizioni locali, ma anche per migliorare l'evidenza dei loro effetti benefici, permettendo di definirle come prodotti funzionali. Tra le PAM, diverse specie appartenenti alla famiglia delle Lamiaceae godono di una lunga popolarità soprattutto grazie ai loro oli essenziali, che hanno molteplici applicazioni in medicina, cosmetica, gastronomia e aromaterapia. In particolare, il genere *Lavandula* si distingue per la sua tradizionale applicazione nel trattamento di depressione, cefalea, stress, emicrania e diabete (Salehi et al., 2018) e per la recente consapevolezza della possibilità di recuperare bioattivi non volatili da diverse specie del genere (ad esempio *L. angustifolia, L. stoechas, L. peduncolata*) (Upson & Andrews, 2004). Nell'Appennino meridionale, in seguito allo studio delle popolazioni di *L. angustifolia*, Upson & Andrews hanno riconosciuto una nuova specie endemica, limitata ad habitat rocciosi calcarei da 900 a 1750 m s.l.m., che è stata chiamata *L. austroapennina* N.G.Passal., Upson & Tundis [4]. Questa specie, nota localmente come *"spicaddossa"* per gli effetti lenitivi e disinfettanti derivanti dallo sfregamento delle sue foglie, ha una lunga tradizione di utilizzi popolari che si è persa nel tempo e i suoi oli essenziali erano alla base di una preziosa filiera profumiera italo-francese. Il grande interesse del passato per il suo uso locale e la rinnovata consapevolezza dei benefici dei prodotti naturali hanno reso necessario lo studio delle caratteristiche fitochimiche e biologiche di *L. austroapennina* al fine di promuoverne e valorizzarne il nuovo utilizzo. A tal fine, la pianta è stata raccolta sul Monte Cervati (Parco Nazionale del Cilento, Vallo di Diano e Alburni) e sezionata nei suoi vari organi (corolla, calice, foglia, fusto e radici) che sono stati sottoposti a estrazione sequenziale a ultrasuoni in *n*-esano e metanolo, per un completo recupero dei polifenoli. L'analisi UHPLC-HR-MS/MS è stata perseguita per ottenere informazioni sul profilo chimico di ciascun organo, la cui attività antiossidante, antiradicalica e riducente è stata effettuata mediante i test ABTS, DPPH e PFRAP. Infine, per consentire una proficua applicazione in campo cosmeceutico, gli estratti sono stati sottoposti a *screening* per la loro citotossicità sulla linea cellulare umana cheratinocita HaCaT e le proprietà cicatrizzanti sono state analizzate mediante scratch test. I polifenoli sono apparsi distribuiti in modo specifico nei diversi organi, con flavonoidi glicosilati e acilati presenti soprattutto nella corolla e derivati degli acidi idrossicinnamici e degli acidi 8-idrossifenilpropanoici negli organi ipogei. I dati sull' efficacia antiradicalica e riducente, nonché la definizione del profilo di citotossicità sottolineano che, oltre alla corolla, che ha trovato impiego per l'ottenimento di oli essenziali, anche altri organi mostrano attività promettenti, suggerendo così ulteriori indagini per il pieno recupero di questa risorsa locale.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

A phytochemical study of *Limbarda crithmoides* (Asteraceae): an alimurgic plant of Cilento, Vallo di Diano and Alburni National Park

Fiorentino M.[1], Stinca A.[1], Esposito A.[1], Zidorn C.[2], Pacifico S.[1]*

[1]Department of Environmental Biological and Pharmaceutical Sciences and Technologies, University of Campania Luigi Vanvitelli, Via Vivaldi 43, 81100 Caserta, Italy
[2]Pharmazeutisches Institut, Abteilung Pharmazeutische Biologie, Christian-Albrechts-Universität zu Kiel, Gutenbergstraße 76, 24118 Kiel, Germany

* Corresponding author: marika.fiorentino@unicampania.it

Limbarda crithmoides (L.) Dumort. (syn. *Inula crithmoides* L.) is a perennial halophytic plant, is distributed along the rocky coasts of Europe, Great Britain and Western Asia where the sea spray can reach it. It is an edible wild plant traditionally consumed in the Mediterranean area becoming part of traditional cuisine in many countries. In Lebanon this plant is consumed when the leaves become leathery and served as a part of the "Mezzeh", a variety of Lebanese appetizers (Zurayk & Baalbaki, 1996). *L. crithmoides* has also been reported for the Cilento, Vallo di Diano, and Alburni National Park (PNVCDA), protected areas in the southern Italy, where it is called "Critami" by the local population who add their fresh succulent leaves to the salad for imparting salty flavour to their dishes (Scherrer et al., 2005). This alimurgic species is also used in traditional remedies for the treatment of the overeating to relieve the bowels congestion as well as for the cure of inflammation disease. From a chemical point of view, it is known to contain a variety of secondary metabolites, including polyphenols, thymol derivatives, and sesquiterpene lactones (Bucchini et al., 2013). While previous research had focused primarily on the complete profile of essential oils, this study sought to isolate and purify specialized compounds from the aerial part of the plant. To this purpose, aerial parts of *L. crithmoides* plants were collected in the municipality of Ascea (PNCVDA), in October 2022, dried, finally ground, and underwent maceration in acetone solvent. The crude acetone extract was fractionated with liquid/liquid extraction using solvents with increasing polarity, and the ethyl acetate fraction was selected for further steps of purification. The metabolites from the ethyl acetate fraction were purified by sequential steps of silica gel column chromatography, Sephadex LH-20 gel filtration chromatography, and preparative HPLC. The structure of purified compounds, belonging to terpenoids class, was elucidated using NMR analysis, including 1D and 2D NMR experiments. The results provide valuable information about the chemical constituents of *Limbarda chritmoides* L., which may contribute to new knowledge in the field of natural product chemistry, and also a basis for further research for developing new food ingredients from natural sources.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Studio fitochimico di *Limbarda crithmoides* (Asteraceae): una pianta alimurgica nel Parco Nazionale del Cilento, Vallo di Diano ed Alburni

Fiorentino M.[1], Stinca A.[1], Esposito A.[1], Zidorn C.[2], Pacifico S.[1]*

[1]Department of Environmental Biological and Pharmaceutical Sciences and Technologies, University of Campania Luigi Vanvitelli, Via Vivaldi 43, 81100 Caserta, Italy
[2]Pharmazeutisches Institut, Abteilung Pharmazeutische Biologie, Christian-Albrechts-Universität zu Kiel, Gutenbergstraße 76, 24118 Kiel, Germany

*Corresponding author: marika.fiorentino@unicampania.it

Limbarda crithmoides (L.) Dumort. (syn. *Inula crithmoides*), una pianta alofita perenne, è distribuita lungo le coste dell'Europa, della Gran Bretagna e dell'Asia occidentale e cresce sulle colture rocciose costiere, dove può essere raggiunta dagli spruzzi del mare. Si tratta di una pianta selvatica edibile tradizionalmente consumata nell'area mediterranea che entra a far parte della cucina tradizionale in molti paesi. In Libano questa pianta è consumata quando le foglie diventano coriacee e servita come parte del "Mezzeh", una varietà di antipasti libanesi (Zurayk & Baalbaki, 1996). Questa specie è stata segnalata anche nel Parco Nazionale del Cilento, Vallo di Diano e Alburni (PNVCDA), un'area protetta dell'Italia meridionale, dove viene chiamata "Critami" dalle popolazioni locali che aggiungono le foglie fresche succulente all'insalata per conferire sapidità ai loro piatti (Scherrer et al., 2005). Questa specie è utilizzata anche nei rimedi tradizionali per il trattamento dell'eccesso di cibo alleviando la congestione intestinale e per la cura delle malattie infiammatorie. Dal punto di vista chimico, è noto che contiene una varietà di metaboliti secondari, inclusi polifenoli, derivati del timolo e lattoni sesquiterpenici (Bucchini et al., 2013). Mentre le ricerche scientifiche precedenti si sono concentrate principalmente sull'ottenimento di un profilo completo degli oli essenziali della pianta, questo studio mira ad isolare e purificare composti specializzati dalle parti aeree della pianta. A tale scopo, *Limbarda crithmoides* L. è stata raccolta nel comune di Ascea (PNCVDA), nell'ottobre 2022. Le parti aeree sono state essiccate, finemente macinate e sottoposte a macerazione in acetone. L'estratto crudo è stato frazionato con estrazione liquido/liquido utilizzando solventi con polarità crescente e la frazione in acetato di etile è stata selezionata per ulteriori fasi di purificazione. I metaboliti dalla frazione acetato di etile sono stati purificati mediante step sequenziali di cromatografia su colonna di gel di silice, cromatografia per filtrazione su gel di Sephadex LH-20 ed HPLC preparativa. La struttura dei composti purificati, appartenenti alle classi dei terpenoidi, è stata delucidata mediante spettroscopia NMR (1D e 2D). I risultati contribuiscono a fornire preziose informazioni sui metaboliti specializzati di *Limbarda chritmoides* L., nuove conoscenze nel campo della chimica dei prodotti naturali e una base per ulteriori ricerche per lo sviluppo di nuovi ingredienti alimentari da fonti naturali.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Chemical insights into olive tree cv. Caiazzana pruning/defoliation residue

Mushtaq H., Piccolella S., Formato M., Pacifico S.*

Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania "Luigi Vanvitelli", Via Vivaldi 43, 81100 Caserta, Italy

*Corresponding author: hamid.mushtaq@unicampania.it

Olives (*Olea europaea* L.) and olive oil have been widely studied for their flavour and health benefits, but the olive leaves and their chemical composition have only recently attracted interest (Antolovich et al., 2002). This is because olive leaves chemically contain a high number of specialized compounds mainly phenolic secoiridoids and flavonoids (Antolovich et al., 2002; Zarrouk et al., 2012; Orak et al., 2019). These compounds are worthy due to their several uses as anti-bacterial, anti-inflammatory and antioxidant in nutraceutical and food sectors. Moreover, olive leaves by the pruning and harvesting of olive trees represent one of the by products of olive oil industry with negative environmental impact. In this context, it is of interest to explore the potential resource of olive leaves, also taking into account cultivar biodiversity. Herein, the leaves from *Olea europaea* L. cv. Caiazzana, an autochthonous cultivar of Southern Italy, were collected after pruning in an orchard near Caiazzo (Caserta, Italy). The leaves first underwent ultrasound-assisted extraction (UAE) (Lama-Muñoz et al., 2019; Pacifico et al., 2022), using extractants with decreasing polarity, and extracts obtained differently fractionated by extractive and chromatographic techniques in order to massively remove photosynthetic pigments, small organic acids and sugars. Among the others, a polyphenol fraction and a pentacyclic triterpene fraction were obtained and quali quantitatively profiled by UHPLC-ESI-Q*q*TOF-MS/MS techniques. Both the fractions were evaluated for their antiradical capability, and Fe(III) reducing power, while an extensive cytotoxic screening was carried out towards normal-like and cancer cells. Pentacyclic triterpene fraction strongly inhibited the cell growth of tested cancer cells, while it was unable to exert antioxidant efficacy. This latter was massively exhibited by polyphenol fraction, which consisted of oleuropein derivatives and flavone glycosides. Data acquired suggest further exploitation of residues from the processing of Caiazzana variety, whose olives are used for the production of oil, which has recently obtained "Colline Caiatine" DOP, and as table oil, and for preparing the traditional "baked" olives, broadly consumed as a peculiar and tasty local appetizer.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Fitochimica dei residui di potatura/defogliazione dell'olivo cv. Caiazzana

Mushtaq H., Piccolella S., Formato M., Pacifico S.*

Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania "Luigi Vanvitelli", Via Vivaldi 43, 81100 Caserta, Italy

*Corresponding author: hamid.mushtaq@unicampania.it

Le olive e l'olio d'oliva sono stati ampiamente studiati per il loro sapore e per gli enormi benefici per la salute, ma le foglie di olivo (Olea europaea L.) e la loro composizione chimica hanno destato interesse solo di recente (Antolovich et al., 2002). Ciò è dovuto al fatto che le foglie di olivo contengono dal punto di vista chimico un numero elevato di composti specializzati, principalmente secoiridoidi fenolici e flavonoidi (Antolovich et al., 2002; Zarrouk et al., 2012; Orak et al., 2019). Questi composti sono meritevoli per i loro molteplici usi come antibatterici, antinfiammatori e antiossidanti nel settore nutraceutico e alimentare. Inoltre, le foglie di olivo derivanti dalla potatura e dalla raccolta degli ulivi rappresentano uno dei sottoprodotti dell'industria olearia con impatto ambientale negativo. In questo contesto, è interessante esplorare la potenziale risorsa delle foglie di olivo, tenendo conto anche della biodiversità delle cultivar. In tale contesto, le foglie di Olea europaea L. cv. Caiazzana, cultivar autoctona del Sud Italia, sono state raccolte dopo potatura in un frutteto nei pressi di Caiazzo (Caserta, Italia). Le foglie sono state dapprima sottoposte ad estrazione assistita da ultrasuoni (UAE) (Lama-Muñoz et al., 2019; Pacifico et al., 2022), utilizzando estraenti con polarità decrescente, e gli estratti ottenuti sono stati diversamente frazionati mediante tecniche estrattive e cromatografiche al fine di rimuovere in modo massivo pigmenti fotosintetici, piccoli acidi organici e zuccheri. Tra le altre, sono state ottenute una frazione polifenolica e una frazione triterpenica pentaciclica profilate quali-quantitativamente mediante tecniche UHPLC-ESI-QqTOF-MS/MS. Entrambe le frazioni sono state valutate per la loro capacità antiradicalica e per il potere riducente del Fe(III), mentre è stato effettuato un ampio screening citotossico verso cellule normali e tumorali. La frazione triterpenica pentaciclica ha fortemente inibito la crescita cellulare delle cellule tumorali testate, mentre non è stata in grado di esercitare efficacia antiossidante. Al contratio, quest'attività è stata massicciamente esibita dalla frazione polifenolica, che consisteva in derivati dell'oleuropeina e glicosidi flavonici. I dati acquisiti suggeriscono un ulteriore sfruttamento dei residui della lavorazione della varietà Caiazzana, le cui olive sono utilizzate per la produzione dell'olio, che ha recentemente ottenuto la DOP "Colline Caiatine", e come olio da tavola, e per la preparazione delle tradizionali olive "al forno", largamente consumato come particolare e gustoso antipasto locale.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Phytochemical and pharmacological ethnobotanical study of *Calamintha grandiflora* subsp. *baborensis*

Nacerbey N. [1,2]*, *Bouit L.* [1]

[1] Ecole Nationale des Sciences Agronomique El Harrach. Alger
[2]Laboratoire des ressources génétiques et biotechnologies

*Corresponding author: nazli.nacerbey@edu.ensa.dz

This work falls within the framework of the meeting of up traditional use information's from endemic medicinal plant of Jijel is *Calamintha grandiflora baborensis* Batt belonging to the family *Lamiaceae*, from survey based on 120 survey sheets to the inhabitants of TAZA National Park. Then a phytochemical study of the areal part of the plant was done to characterize the different families of chemical compounds from aqueous extract of this plant.
Also, our work focused on the study of biological activities, including the aqueous extract of this plant has shown a remarkable anti-inflammatory.
And the methanol extract also showed a significant antioxidant activity. The same extract showed significant antimicrobial activity.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Etude ethnobotanique phytochimique et pharmacologique de *Calamintha grandiflora* subsp. *baborensis*

Nacerbey N. [1,2]*, *Bouit L.* [1]

[1] Ecole Nationale des Sciences Agronomique El Harrach. Alger
[2]Laboratoire des ressources génétiques et biotechnologies

*Corresponding author: nazli.nacerbey@edu.ensa.dz

Portant le titre Etude ethnobotanique, phytochimique et pharmacologique de *Calamentha baborensis Batt*
Cette étude a permis la collecte d'un maximum d'information relatif à l'utilisation traditionnelle d'une plante médicinale endémique de la Wilaya de Jijel. Il s'agit de: *Calamentha boborensis Batt* connue sous l'appellation de Toureth, cette plante appartient à la famille des Lamiacées.
Une enquête ethnobotanique a donc été réalisée suite à l'établissement de 120 fiches questionnaires auprès des habitants du Parc National de Taza.
Une étude phytochimique de la partie aérienne de cette plante a été effectuée visant à caractériser les différentes familles de composés chimiques de l'extrait aqueux de cette plante.
De plus, notre travail apporté sur l'étude des activités biologiques, dont l'extrait aqueux de cette plante a montré une activité anti-inflammatoire. L'extrait methanolique a montré aussi une activité antioxydante importante. Le même extrait a montré une activité antimicrobienne non négligeable.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Contribution to the evaluation of the impact of pollution and global warming on chlorophyll synthesis in three Juniperus species, one of which is threatened

Dellaa Y.[1,2], Insaf H., Wissem H.[3], Asma L.[2], Souhil M.[4]*

[1]Higher National School of forests, Khenchela
[2]Abbes Laghrour university, Khenchela
[3]Guelma university
[4]Tebessa university

*Corresponding author: yasminade@gmail.com

Atmospheric pollution and climatic changes are widely felt in the forests of the Aurès region, Algeria, which were once lush. With the aim of bringing precise elements of answer to a question which consists in improving the diagnosis based on the contents in chlorophylls, we were interested in the woody formations with junipers (*Juniperus* L.) by having recourse to three species: (*Juniperus Oxycedrus* L., *Juniperus Phoenicea* L. and an endemic species, namely *Juniperus Thurifera* L.) threatened with extinction. Five sampling stations are chosen for samples that concern only needles and whorls, on which a chlorophyll analysis is performed in the laboratory. The results show a variation in chlorophyll content from one station to another. The station that appears to be the least affected has a level of 1,29 µg/g MF, where *Juniperus oxycedrus* L. records the highest concentration. This station, located at the top of Mount Chelia, appears to be far from any apparent pollution. At the same time *J. Phoenicea* L. and *J. thurifera* L. show lower concentrations with (0,91 µg/g MF) and (0,94 µg/g MF) respectively in the station S4. This station appears to be the most affected by gaseous effluents. Male specimens of *J. thurifera* L. show higher levels than female individuals. Numerous studies, dedicated specifically to *J. thurifera* L., constitute a solid knowledge base concerning this endemic tree, which constitutes a very important resource for the country. The increase of temperatures from year to year as well as the atmospheric pollution, amplified by the long period of drought and the global changes, seem alarming, because the consequences will be able to install an abiotic stress in Juniperus leading to a decline already observed.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Contribution à l'évaluation de l'impact de la pollution et du réchauffement climatique sur la synthèse de la chlorophylle chez trois espèces de Juniperus dont une menace

Dellaa Y.[1,2], Insaf H., Wissem H.[3], Asma L.[2], Souhil M.[4]*

[1]Higher National School of forests, Khenchela
[2]Abbes Laghrour university, Khenchela
[3]Guelma university
[4]Tebessa university

*Corresponding author: yasminade@gmail.com

La pollution atmosphérique et les changements climatiques se font largement ressentir dans les forêts de la région des Aurès, En Algérie, jadis luxuriantes. Dans le but d'apporter des éléments de réponse précis à une interrogation qui consiste à améliorer le diagnostic basé sur les teneurs en chlorophylles, nous nous sommes intéressés aux formations ligneuses à genévriers (*Juniperus* L.) en ayant recours à trois espèces: (*Juniperus oxycedrus* L., *Juniperus phoenicea* L. et une espèce endémique, à savoir *Juniperus thurifera* L.) menacée de disparition. Cinq stations de prélèvements sont choisies pour des échantillons qui concernent uniquement les aiguilles et les verticilles, sur lesquels une analyse des chlorophylles est réalisée au laboratoire. Les résultats montrent une variation des teneurs en chlorophylles d'une station à une autre. La station qui parait la moins touchée a une teneur de 1,29 µg/g MF, où *Juniperus oxycedrus* L. enregistre la concentration la plus élevée. Cette station, située au sommet du mont Chélia, parait loin de toute pollution apparente. Au moment où J*. phoenicea* L. et *J. thurifera* L. affichent des concentrations plus faibles avec (0,91 µg/g MF) et (0,94 µg/g MF) respectivement dans la station S4. Cette station parait la plus touchée par les effluents gazeux. Les spécimens males de *J. thurifera* L. montrent des teneurs plus élevées que ceux femelles. De nombreuses études, dédiées spécifiquement à *J. thurifera* L., constituent une base de connaissances solide concernant cet arbre endémique, qui constitue une ressource très importante pour le pays. L'augmentation des températures d'année en année ainsi que la pollution atmosphérique, amplifiées par la longue période de sécheresse et les changements globaux, paraissent alarmants, car les conséquences pourront installer un stress abiotique chez *Juniperus* aboutissant à un dépérissement déjà observé.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Main challenges in the monitoring of habitats and species of Community Interest in Portugal

Meireles C.[1,2], Baião C.[1,2], Ferreira L.[1,2], Pinto Gomes C.[1,2]*

[1]MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute, Escola de Ciências e Tecnologia, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal
[2]Escola de Ciência e Tecnologia - University of Évora – Portugal, Colégio Luís António Verney, 7000 Évora

*Corresponding author: cmeireles@uevora.pt

The monitoring of species and habitats, common practices in biology studies, has assumed progressive importance in the European Union since the nineties, greatly encouraged by the Habitats Directive. Currently, Member States are required to monitor the conservation status of species and habitats classified under this Directive, a process that is reported every 6 years. However, both evaluation and biological monitoring require not only the availability of basic information, but also the existence of scientifically tested and standardized methodologies, in order to be comparable between territories. Thus, two large sets of issues arise: [1] the lack of basic scientific knowledge, including problems related to the definition of biological indicators, lack of comparative studies between different methodologies or errors associated with sampling; [2] the lack of means to implement the monitoring of species and habitats, including trained professionals (project managers, botanists, ecologists) and budget. In Portugal, the lack of a proper strategy and regular funding has resulted in a poor monitoring, based mostly on expert opinion, from researchers of a few Portuguese universities. In this presentation, an overview of this issue will be presented also addressing the most used monitoring methodologies.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Desafios à monitorização dos habitats e espécies de Interesse Comunitário em Portugal

Meireles C.[1,2], Baião C.[1,2], Ferreira L.[1,2], Pinto Gomes C.[1,2]*

[1]MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute, Escola de Ciências e Tecnologia, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal
[2]Escola de Ciência e Tecnologia - University of Évora – Portugal, Colégio Luís António Verney, 7000 Évora

*Corresponding author: cmeireles@uevora.pt

A monitorização de espécies e habitats, práticas comuns em estudos de biologia, foi assumindo progressiva importância na União Europeia desde os anos noventa, muito impulsionada pela Diretiva Habitats. Atualmente, os estados membros são obrigados a monitorizar o estado de conservação das espécies e habitats classificados no âmbito desta Diretiva, processo que é reportado a cada 6 anos. Porém, tanto a avaliação como a monitorização biológica requerem, não só a disponibilidade de informação de base, mas também a existência de metodologias cientificamente testadas e padronizadas, de forma a serem comparáveis entre territórios. Assim, dois grandes conjuntos de questões se levantam: [1] a falta de conhecimento científico de base, incluindo problemas relacionados com a definição de indicadores biológicos, falta de estudos comparativos entre diferentes metodologias ou de erros associados à amostragem; [2] a falta de meios para implementar a monitorização de espécies e habitats, incluindo profissionais capacitados (gestores de projeto, botânicos, ecologistas) e meios financeiros. Em Portugal, a falta de uma estratégia consertada e de financiamento regular, tem resultado em trabalhos de monitorização de habitas baseados maioritariamente em expert opinion, recorrendo a investigadores das várias universidades portuguesas. Nesta apresentação será feito um ponto de situação sobre esta temática, abordadas as metodologias de monitorização disponíveis e mais utilizadas, assim como serão dados exemplos da sua aplicação.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Flora and vegetation of Habitat "7140: Transition mires and quaking bogs" in the Aspromonte National Park (Southern Italy).

Laface V.L.A. [1]*, *Musarella C. M.* [1], *Noto D.* [2], *Siclari A.*[3], *Tralongo S.* [4†], *Spampinato G.*[1]

[1] Department of AGRARIA, Mediterranean University of Reggio Calabria, 89122 Reggio Calabria, Italy.
[2] Naturschutzamt, Landkreis Cuxhaven, Vincent-Lübeck-Straße 2, 27474 Cuxhaven, Germany.
[3] Città Metropolitana di Reggio Calabria, Piazza Italia, 89100 Reggio Calabria, Italy.
[4] Aspromonte National Park, Via Aurora, 1, 89057 Gambarie di S. Stefano in Aspromonte, Italy.

*Corresponding author: vla.laface@unirc.it

The peat bog habitat is prevalent in north-central Europe, and is related to a temperate climate with marked oceanic characteristics. In the Mediterranean areas this habitat is rare and localised. In Italy, it is widespread mainly in the Alps and central-northern Apennines, decreasing drastically towards the south (Bracco et al., 2004). In Calabria, sphagnum peat bogs are mainly present in Sila, with a few sites on the Catena Costiera and Serre. The Aspromontane peat bogs are smaller in size than those in Sila and are the southernmost in the Italian peninsula. These are distributed in the mountainous belt at altitudes between 730 and 1870 m asl, have surface areas between 0.1 and 1 hectare (Brullo et al., 2001; Spampinato et al., 2008; Licandro, 2011) and fall in 'Temperate oceanic' or 'Mediterranean seasonal oceanic' macro-bioclimate areas (Pesaresi et al., 2014).
The peat bogs present in Aspromonte are all referable to the EEC Directive 43/92 habitat "7140: Transition mires and quaking bogs", characterised by vegetation communities forming peat deposits and floating mats, with oligotrophic to mesotrophic waters, in which the ombrotrophic and minerotrophic (groundwater) components are mixed as the colonised surfaces are mainly flat or undulating, with small depressions. The vegetation was studied using the phytosociological method, carrying out 8 surveys and 2 transects. Seventy species of vascular plants were surveyed, which establish themselves on the mossy carpet consisting mainly of *Sphagnum inundatum*. Among the species of particular conservation interest, mention must be made of some at the southern limit of their distribution range such as *Caltha palustris* L.; *Carex echinata* Murray; some endemic *Agrostis canina* L. subsp. *aspromontana* Brullo, Scelsi & Spamp.; *Soldanella calabrella* Kress; *Genista brutia* Brullo, Scelsi & Spamp. and others of particular conservation interest such as: *Juncus articulatus* L.; *Juncus bulbosus* L.; *Potamogeton polygonifolius* Pourr.; *Veronica scutellata* L.; *Potentilla erecta* (L.) Raeusch. (Brullo et al., 2001; Licandro, 2011).
The Aspromonte peat bogs belong to the association *Sphagno inundati-Caricetum echinateae* Brullo, Scelsi, Spamp. 2001, alliance *Caricion fuscae* Koch 1926, order *Caricetalia fuscae* Koch 1926, class *Scheuchzerio-Caricetea fuscae* Tx. 1937. These are rather mobile overhangs with sphagnum pads on the surface, crossed by small rivulets with slowly flowing water, the latter being occupied by the association *Ranunculo fontani-Potametum polygonifolii* Brullo, Scelsi, Spamp. 2001, alliance *Hyperico elodis-Sparganion* Br.-Bl. et Tx. ex Oberd. 1957, order *Littorelletalia uniflorae* Koch 1926, class *Littorelletea uniflorae* Br.-Bl. & Tüxen ex Westhoff, et al. 1946 (Brullo et al. 2001; Biondi & Blasi 2015).
A total of 12 sites were surveyed, three of which were not known from the literature, while two were found to be extinct. Eleven sites fall within the perimeter of the Aspromonte National Park and three are also included in the Natura 2000 network. The study has made it possible to update knowledge on the conservation status of each peat bog and to detect critical points, mainly due to anthropic activity, such as variations in the overall hydrological system, grazing or transit of livestock, including wild boars.
In order to preserve this fragile and easily altered habitat, special attention in management and continuous monitoring over time is required.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Flora e vegetazione dell'Habitat "7140: Torbiere di transizione e instabili" nel Parco Nazionale dell'Aspromonte (Southern Italy).

Laface V.L.A. [1]*, *Musarella C.M.* [1], *Noto D.* [2], *Siclari A.*[3], *Tralongo S.* [4†], *Spampinato G.*[1]

[1] Department of AGRARIA, Mediterranean University of Reggio Calabria, 89122 Reggio Calabria, Italy.
[2] Naturschutzamt, Landkreis Cuxhaven, Vincent-Lübeck-Straße 2, 27474 Cuxhaven, Germany.
[3] Città Metropolitana di Reggio Calabria, Piazza Italia, 89100 Reggio Calabria, Italy.
[4] Aspromonte National Park, Via Aurora, 1, 89057 Gambarie di S. Stefano in Aspromonte, Italy.

*Corresponding author: vla.laface@unirc.it

L'habitat di torbiera è diffuso prevalentemente nell'Europa centro-settentrionale, ed è legato al clima temperato con marcati caratteri di oceanicità. Nei territori del Mediterraneo questo habitat è raro e localizzato. In Italia è diffuso principalmente sulle Alpi e sull'Appennino centro-settentrionale, diminuendo drasticamente verso Sud (Bracco et al., 2004). In Calabria, le torbiere a sfagni sono presenti soprattutto in Sila, con pochi siti sulla Catena Costiera e sulle Serre. Le torbiere aspromontane, sono di dimensioni ridotte rispetto a quelle della Sila e risultano essere le più meridionali della Penisola Italiana. Queste sono distribuite nella fascia montana a quote comprese tra 730 e i 1870 m s.l.m., hanno superfici comprese tra 0.1 e 1 ettaro (Brullo et al., 2001; Spampinato et al., 2008; Licandro, 2011) e ricadono in aree a macrobioclima di tipo "Temperato oceanico" o "Mediterraneo pluvio stagionale oceanico" (Pesaresi et al., 2014).
Le torbiere presenti in Aspromonte sono tutte riferibili all'habitat di direttiva CEE 43/92 "7140: Torbiere di transizione e instabili", caratterizzato da comunità vegetali formanti depositi torbosi e tappeti flottanti, con acque da oligotrofiche a mesotrofiche, nelle quali la componente ombrotrofica e quella minerotrofica (della falda) si mescolano poiché le superfici colonizzate sono prevalentemente piane o ondulate, con piccole depressioni. Lo studio della vegetazione è stato svolto con il metodo fitosociologico, realizzando 8 rilievi e 2 transetti. Sono state censite 70 specie di piante vascolari, che si impiantano sul tappeto muscinale costituito in prevalenza da *Sphagnum inundatum*. Tra le specie di particolare interesse conservazionistico, vanno ricordate alcune al limite meridionale del loro areale di distribuzione quali *Caltha palustris* L.; *Carex echinata* Murray; alcune endemiche: *Agrostis canina* L. subsp. *aspromontana* Brullo, Scelsi & Spamp.; *Soldanella calabrella* Kress; *Genista brutia* Brullo, Scelsi & Spamp.e altre di particolare interesse conservazionistico quali: *Juncus articulatus* L.; *Juncus bulbosus* L.; *Potamogeton polygonifolius* Pourr.; *Veronica scutellata* L.; *Potentilla erecta* (L.) Raeusch. (Brullo et al., 2001; Licandro, 2011).
Le torbiere dell'Aspromonte rientrano nell'associazione *Sphagno inundati-Caricetum echinateae* Brullo, Scelsi, Spamp. 2001, alleanza *Caricion fuscae* Koch 1926, ordine *Caricetalia fuscae* Koch 1926, classe *Scheuchzerio-Caricetea fuscae* Tx. 1937. Si tratta di aggallati piuttosto mobili con cuscinetti di sfagni in superficie, attraversati da piccoli rivoli con acque lentamente fluenti, quest'ultimi sono occupati dall'associazione *Ranunculo fontani-Potametum polygonifolii* Brullo, Scelsi, Spamp. 2001, alleanza *Hyperico elodis-Sparganion* Br.-Bl. et Tx. ex Oberd. 1957, ordine *Littorelletalia uniflorae* Koch 1926, classe *Littorelletea uniflorae* Br.-Bl. & Tüxen ex Westhoff, et al. 1946 (Brullo et al. 2001; Biondi & Blasi 2015).
Sono stati censiti un totale di 12 siti, di cui tre non noti in letteratura, mentre di due si è accertata l'estinzione. Undici siti rientrano all'interno del perimetro del Parco Nazionale dell'Aspromonte e tre rientrano anche nella rete Natura 2000. Lo studio ha permesso di aggiornare le conoscenze sullo stato di conservazione di ciascuna torbiera e rilevarne le criticità, prevalentemente riconducibili all'attività antropica, quali variazioni del sistema idrologico complessivo, pascolo o transito di bestiame anche selvatico (cinghiali).
Al fine di preservare questo habitat fragile e facilmente alterabile, è richiesta una particolare attenzione nella gestione e un monitoraggio continuo nel tempo.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Analysis and conservation of secondary grasslands: opportunities and needs for endangered animal and plant species, and for the local communities of the Maiella National Park

Di Martino L.[1,3], Angelucci S.[1], Morbidini L.[2], Pauselli M. [2], Vizzari M.[2], Di Cecco V.[1], Bonini F.[2], Madonna L.[1], Valenti B. [2], Gigante D.[1]*

[1]Maiella National Park, Via Badia 28 - 67039 Sulmona (AQ), Italy.
[2]Department of Agricultural, Food and Environmental Sciences (DSA3), University of Perugia, Borgo XX giugno, 74 - 06121 Perugia, Italy.
[3]School of Advanced Studies, The 'Gabriele d'Annunzio' University CHIETI-PESCARA, Via dei Vestini, 31 - 66013 Chieti Scalo (Italia), Italy.

*Corresponding author: luciano.dimartino@parcomaiella.it

The territory of Maiella National Park, located in the central part of the Abruzzo region, strategic bio geographical point for the confluence of species of Euro-Siberian, Mediterranean and Balkan distribution as well as tension area between the Mediterranean and mid European regions from a climatic point of view, guards a flora of more than 2100 entities (species and subspecies) recorded (beyond 65% flora of Abruzzo, almost 30% of the Italian one), 15% of which are endemic and/or included in protected categories.
The current vegetal cover on the terraced fields and drystone complexes of the northern Majella is characterized by a conspicuous mosaic of fields slowly being overgrown by woody plants a sign of the well-advanced secondary succession of various plant communities, a process triggered by the abandonment of farming and shepherding activities following the Second World War. Over approximately the past fifty years rapid and marked changes have been occurring to these semi-natural landscapes, notably secondary pastures (those created after the cutting of forests), shaped in a long process stretching as far back in time as the Neolithic era. With these changes, historical aspects of the landscape tend to be substituted by new equilibriums. The secondary grasslands represent an emblematic challenge for nature conservation in protected areas. Their semi-natural origin and intrinsic dependence on grazing, as well as their huge variety of types and notable floristic richness, represent the two sides of the same coin and embody the result of a long-lasting, dynamic tension between use and preservation. Mapping and monitoring grassland habitats, when represented by Annex I types, are activities required by Directive 92/43/EEC, in order to understand their dynamics in space and time and define sustainable management practices. Their maintenance in a favourable conservation status should in fact be grounded on an integrated approach, combining a floristic, phytocoenotic, and ecological understanding with the implementation of sustainable use and practices. Field surveys carried out by botanists still represent an essential step for habitat detection and identification, while trends and processes may receive adequate support from remote sensing technologies. The territory of Maiella National Park, one of the biodiversity-richest sites in Europe, hosts huge grassland areas. It has been affected in the last decades by land depopulation and a long-lasting trend of reduction in livestock farming activities and extensive grazing. We present here the results of an integrated study of the areas occupied by grassland vegetation within the hilly, montane, and, partly, subalpine belts of the Park, taking into account their floristic composition, vegetation traits, ecological-environmental characteristics, pastoral value, distribution, and productivity indices.
The collected data allowed the identification of 20 plant communities belonging to different phytosociological classes, from *Festuco-Brometea* to *Nardetea strictae*, *Molinio-Arrhenatheretea*, and *Elyno-Seslerietea*, mostly referable to the Annex I Habitat types 6210(*), 6230*, and (to a lesser extent) 6510 and 6170.
An NDVI-based web interface, running on Google Earth Engine, has been implemented, as well, for near-real-time analysis of the vigor and phenological phases of the grassland vegetation, as a support for more rational and sustainable use of the areas by breeders. The present study intends to be a first contribution to the comprehensive development of an integrated management system of a large, diversified area where different interests, such as the environmental, economic, social, and cultural ones, meet, intersect, and sometimes collide, thus shaping the landscape and its territorial identity.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Azioni di ricerca e conservazione sui pascoli secondari: oppurtunità e necessità per le specie vegetali e animali a rischio di estinzione, e per le comunità locali del Parco Nazionale della Maiella

Di Martino L.[1,3]*, *Angelucci S.*[1], *Morbidini L.*[2], *Pauselli M.*[2], *Vizzari M.*[2], *Di Cecco V.*[1], *Bonini F.*[2], *Madonna L.*[1], *Valenti B.*[2], *Gigante D.*[1]

[1]Maiella National Park, Via Badia 28 - 67039 Sulmona (AQ), Italy.
[2]Department of Agricultural, Food and Environmental Sciences (DSA3), University of Perugia, Borgo XX giugno, 74 - 06121 Perugia, Italy.
[3]School of Advanced Studies, The 'Gabriele d'Annunzio' University CHIETI-PESCARA, Via dei Vestini, 31 - 66013 Chieti Scalo (Italia), Italy.

*Corresponding author: luciano.dimartino@parcomaiella.it

Il territorio del Parco Nazionale della Maiella, situato nella parte centrale della regione Abruzzo, punto biogeografico strategico per la confluenza di specie a distribuzione eurosiberiana, mediterranea e balcanica nonché area di tensione tra le regioni mediterranea e continentale dal punto di vista climatico, custodisce una flora di oltre 2100 entità (specie e sottospecie) censite (oltre il 65% della flora abruzzese, quasi il 30% di quella italiana), di cui il 15% endemiche e/o incluse in categorie protette.
L'attuale copertura vegetale dei campi terrazzati e dei complessi a secco della Majella settentrionale è caratterizzata da un cospicuo mosaico di campi in lenta ricopertura di piante arboree, segno dell'avanzata successione secondaria di diverse comunità vegetali, processo innescato dall'abbandono delle attività agricole e pastorali successive alla seconda guerra mondiale. Negli ultimi cinquant'anni circa si sono verificati rapidi e marcati cambiamenti in questi paesaggi seminaturali, in particolare i pascoli secondari (quelli creati dopo il taglio delle foreste), modellati in un lungo processo che risale al Neolitico. Con questi mutamenti, gli aspetti storici del paesaggio tendono a essere sostituiti da nuovi equilibri.
Le praterie secondarie rappresentano una sfida emblematica per la conservazione della natura nelle aree protette. La loro origine seminaturale e l'intrinseca dipendenza dal pascolo, così come la grande varietà di tipologie e la notevole ricchezza floristica, rappresentano le due facce della stessa medaglia e incarnano il risultato di una duratura e dinamica tensione tra uso e conservazione. La mappatura e il monitoraggio degli habitat delle praterie, quando rappresentati dalle tipologie di cui all'Allegato I, sono attività richieste dalla Direttiva 92/43/CEE, al fine di comprenderne le dinamiche nello spazio e nel tempo e definire pratiche di gestione sostenibili. Il loro mantenimento in uno stato di conservazione favorevole dovrebbe infatti basarsi su un approccio integrato, combinando una comprensione floristica, fitocenotica ed ecologica con l'implementazione di usi e pratiche sostenibili.
Le indagini sul campo effettuate dai botanici rappresentano ancora un passaggio essenziale per il rilevamento e l'identificazione degli habitat, mentre le tendenze dei processi possono ricevere un adeguato supporto dalle tecnologie di telerilevamento.
Il territorio del Parco Nazionale della Maiella, uno dei siti più ricchi di biodiversità in Europa, ospita vaste aree prative (pascoli secondari e praterie primarie). Negli ultimi decenni è stata colpita dallo spopolamento della terra e da una tendenza di lunga durata alla riduzione delle attività di allevamento e del pascolo estensivo. Si presentano i risultati di uno studio integrato delle aree occupate da vegetazione prativa all'interno della fascia collinare, montana e, in parte, subalpina del Parco, tenendo conto della composizione floristica, dei caratteri vegetazionali, delle caratteristiche ecologico-ambientali, del valore pastorale, distribuzione e indici di produttività.
I dati raccolti hanno permesso di identificare 20 comunità vegetali appartenenti a diverse classi fitosociologiche, da *Festuco-Brometea* a *Nardetea strictae*, *Molinio-Arrhenatheretea*, ed *Elyno-Seslerietea*, per lo più riconducibili ai tipi di Habitat dell'Allegato I 6210(*), 6230*, e (in misura minore) 6510 e 6170.
È stata inoltre implementata un'interfaccia web basata su NDVI, funzionante su Google Earth Engine, per l'analisi quasi in tempo reale del vigore e delle fasi fenologiche della vegetazione dei prati, a supporto di un uso più razionale e sostenibile delle aree dagli allevatori.
Il presente studio vuole essere un primo contributo allo sviluppo complessivo di un sistema di gestione integrato di un territorio ampio e diversificato, dove interessi diversi, come quelli ambientali, economici, sociali e culturali, si incontrano, si intersecano e talvolta si scontrano, così da plasmare il paesaggio e la sua identità territoriale.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Typology and cartography of the vegetation of the Menaceur region (Wilaya de Tipaza)

Kadid Y., Touil A., Siab-Farsi B., Bouzahar C.*

Laboratoire de Conservation, Gestion et Amélioration des Ecosystèmes Forestiers
Ecole Nationale Supérieure Agronomique. Alger

*Corresponding author: yamina.kadid@edu.ensa.dz

This work focuses on the mapping of land use and vegetation in the region of Menaceur (Wilaya de Tipaza), by creating a geographical database, created from digital information from satellite images from Google Earth Pro and descriptive data of the study area, with the contribution of a Geographic Information System under Arc GIS 10.2.2.
The results obtained show the distribution of the different units of land use and vegetation, which in relation to topographic ecological factors (Altitude, Exposure, Slope), provide us with information on the state of the vegetation cover in the Menaceur region.
This work is a contribution to the inventory, characterization, evaluation and preservation of the vegetation cover in Tipaza region where various studies on natural vegetation carried out during the last decade.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Typologie et cartographie de la vegetation de la region de Menaceur (Wilaya de Tipaza)

Kadid Y., Touil A., Siab-Farsi B., Bouzahar C.*

Laboratoire de Conservation, Gestion et Amélioration des Ecosystèmes Forestiers
Ecole Nationale Supérieure Agronomique. Alger

*Corresponding author: yamina.kadid@edu.ensa.dz

Le présent travail porte sur la cartographie de l'occupation du sol et de la végétation, de la région de Menaceur (Wilaya de Tipaza), par la réalisation d'une base de données géographique, crée à partir des informations numériques issues des images satellitaires de Google Earth Pro et des données descriptives de la zone d'étude, avec l'apport d'un Système d'Information Géographique sous Arc GIS 10.2.2.
Les résultats obtenus montrent la répartition des différentes unités de l'occupation du sol et de la végétation, qui par rapport aux facteurs écologiques topographiques (Altitude, Exposition, Pente), nous renseignent sur l'état du couvert végétal de la région de Menaceur.
Ce travail est une contribution à l'inventaire, la caractérisation, l'évaluation et à la préservation du tapis végétal dans la wilaya de Tipaza dans laquelle différentes études sur la végétation naturelles ont été menées durant la dernière décennie.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

A phytosociological and phytogeographical survey of the *Bupleurum fruticosum*-dominated plant communities in the Mediterranean area

Sciandrello S.[1], Bacchetta G.[2], Delage A.[3], Pinto-Gomes C.[4], Rebbas K. [5], Mascia F.[2], Tomaselli V.[6], Giusso del Galdo G.[1]*

[1]Department of Biological, Geological and Environmental Sciences, University of Catania (Italy),
[2]Centre for Conservation of Biodiversity (CCB), Department of Life and Environmental Sciences (DISVA), University of Cagliari, Italy
[3]Conservatoire botanique national de Corse, Uffiziu di l'Ambiente di a Corsica, 14 Avenue Jean Nicoli 20250 CORTI
[4]Department of Landscape, Environment and Development, School of Science and Technology, University of Évora, Mediterranean Institute for Agriculture (MED), Institute of Earth Sciences (ICT), Évora, Portugal
[5]SNV Department, Faculty of Sciences, University of M'Sila, M'Sila 28000 Algeria, Laboratory of Agro-Biotechnology and nutrition in arid and semi-arid zones. Ibn Khaldoun University, Tiaret, Algeria
[6]Department of Biosciences, Biotechnologies and Environment, University of Bari "Aldo Moro", Italy

*Corresponding author: s.sciandrello@unict.it

A comparative investigation on the *Bupleurum fruticosum* shrubby vegetation in the Mediterranean area is presented. This ancestral woody species, with a Mediterranean-Atlantic distribution, forms shrubby plant communities chiefly belonging to the *Oleo sylvestris-Ceratonion siliquae* and *Ericion arboreae* alliances (*Quercetea ilicis*). Aim of our study is to analyse all known and new syntaxa with *Bupleurum fruticosum* (vegetation cover ≥ 3), in order to provide a coherent phytosociological arrangement considering the floristic, chorologic, and ecological features of the surveyed phytocoenoses. A total of 139 phytosociological relevés (of which 41 unpublished) were processed. Original Braun-Blanquet sampling scale has been transformed into the ordinal scale according to Van der Maarel (1979). All the relevés are classified using classification and ordination methods. Multivariate analysis and ordination of the dataset are performed using PC-ORD 6 software. The processed plant communities are: *Bupleuro fruticosi-Quercetum ilicis* (Sciandrello et al. 2013, Castelmola, Sicily); *Cytiso sessilifolii-Bupleuretum fruticosi* (Rivas-Martínez 1969, Barcellona, Spagna); *Bupleuro fruticosi-Euphorbietum dendroidis* (Géhu et al. 1992, Capo Carbon at Béjaïa, Algeria); *Hippocrepido emeri-Bupleuretum fruticosi* (Brullo et al. 1993, Minissale et al. 2007, Cava Ispica, Pantalica, Iblei, Sicily); *Spartio juncei-Bupleuretum fruticosi* (Raimondo & Ilardi 2009, Sciandrello et al. 2013, Nebrodi, Peloritani, Sicily); *Bupleurum fruticosum* comm. (Marcenò et al. 2011, Enna; Sciandrello unpublished, Peloritani, Sicily); *Bupleurum fruticosum* subsp. *insulare* comm. (Alain Delage unpublished, Corse); *Bupleurum fruticosum* subsp. *insulare* comm. (Bacchetta & Mascia unpublished, Monte Padenteddu, Sulcis e Sassa Putzu, Barbagia di Seulo, Sardinia); *Phillyreo angustifoliae-Arbutetum unedonis* subass. *bupleuretosum fruticosi* (Cano et al. 1998, Venta Lanada, Màlaga, Spain); *Cytiso baetici-Arbutetum unedonis* subass. *bupleuretosum fruticosi* (Pèrez-Latorre et al. 1993, Andalucìa, Spain); *Bupleuro fruticosae-Arbutetum unedonis* (Capelo et al. 2002, Serra da Arrabida, Portogallo); *Bupleuro rigidi-Arbutetum unedonis* (Torres & Cano in Torres et al. 2002, La Caracolera, Cortijo de la Palomera, Borosa river, Atalaya mountain, Spain); *Aristolochio baeticae-Arbutetum unedonis* (Pinto-Gomes & Cano in Torres et al. 2002, Estoì, Querença, Portugal; Sierra de Lujar, Órgiva, and Almijara, Otivar, Granada, Spain). In conclusion, our study is aiming at (1) providing a coherent phytosociological arrangement of the *Bupleurum fruticosum*-dominated scrublands in Mediterranean area, (2) analysing structure and composition of the surveyed plant communities, (3) and finally, providing more insights on the ecology and dynamism of *Bupleurum fruticosum.*

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Studio fitogeografico e fitosociologico delle fitocenosi a *Bupleurum fruticosum* nell'area mediterranea

Sciandrello S.[1], Bacchetta G.[2], Delage A.[3], Pinto-Gomes C.[4], Rebbas K. [5], Mascia F.[2], Tomaselli V.[6], Giusso del Galdo G.[1]*

[1]Department of Biological, Geological and Environmental Sciences, University of Catania (Italy),
[2]Centre for Conservation of Biodiversity (CCB), Department of Life and Environmental Sciences (DISVA), University of Cagliari, Italy
[3]Conservatoire botanique national de Corse, Uffiziu di l'Ambiente di a Corsica, 14 Avenue Jean Nicoli 20250 CORTI
[4]Department of Landscape, Environment and Development, School of Science and Technology, University of Évora, Mediterranean Institute for Agriculture (MED), Institute of Earth Sciences (ICT), Évora, Portugal
[5]SNV Department, Faculty of Sciences, University of M'Sila, M'Sila 28000 Algeria, Laboratory of Agro-Biotechnology and nutrition in arid and semi-arid zones. Ibn Khaldoun University, Tiaret, Algeria
[6]Department of Biosciences, Biotechnologies and Environment, University of Bari "Aldo Moro", Italy

*Corresponding author: s.sciandrello@unict.it

Viene presentato uno studio comparativo sulla vegetazione arbustiva a dominanza di *Bupleurum fruticosum* nell'area Mediterranea. Questa specie legnosa ancestrale, a distribuzione mediterraneo-atlantica, forma comunità vegetali arbustive rientranti nelle alleanze dell'*Oleo sylvestris-Ceratonion siliquae* e dell'*Ericion arboreae* (*Quercetea ilicis*). Scopo del nostro studio è analizzare le comunità con *Bupleurum fruticosum* (con copertura vegetale ≥ 3), al fine di fornire un inquadramento fitosociologico coerente, considerando le caratteristiche floristiche, corologiche ed ecologiche delle fitocenosi. Sono stati processati complessivamente 139 rilievi fitosociologici (di cui 41 inediti). La scala originale di Braun-Blanquet è stata trasformata nella scala ordinale secondo Van der Maarel (1979). L'analisi multivariata e l'ordinamento del set di dati sono stati eseguiti utilizzando il software PC-ORD 6. Le comunità vegetali considerate sono: *Bupleuro fruticosi-Quercetum ilicis* (Sciandrello et al. 2013, Castelmola, Sicily); *Cytiso sessilifolii-Bupleuretum fruticosi* (Rivas-Martínez 1969, Barcellona, Spagna); *Bupleuro fruticosi-Euphorbietum dendroidis* (Géhu et al. 1992, Capo Carbon at Béjaïa, Algeria); *Hippocrepido emeri-Bupleuretum fruticosi* (Brullo et al. 1993, Minissale et al. 2007, Cava Ispica, Pantalica, Iblei, Sicily); *Spartio juncei-Bupleuretum fruticosi* (Raimondo & Ilardi 2009, Sciandrello et al. 2013, Nebrodi, Peloritani, Sicily); *Bupleurum fruticosum* comm. (Marcenò et al. 2011, Enna; Sciandrello unpublished, Peloritani, Sicily); *Bupleurum fruticosum* subsp. *insulare* comm. (Alain Delage unpublished, Corse); *Bupleurum fruticosum* subsp. *insulare* comm. (Bacchetta & Mascia unpublished, Monte Padenteddu, Sulcis e Sassa Putzu, Barbagia di Seulo, Sardinia); *Phillyreo angustifoliae-Arbutetum unedonis* subass. *bupleuretosum fruticosi* (Cano et al. 1998, Venta Lanada, Màlaga, Spain); *Cytiso baetici-Arbutetum unedonis* subass. *bupleuretosum fruticosi* (Pèrez-Latorre et al. 1993, Andalucìa, Spain); *Bupleuro fruticosae-Arbutetum unedonis* (Capelo et al. 2002, Serra da Arrabida, Portogallo); *Bupleuro rigidi-Arbutetum unedonis* (Torres & Cano in Torres et al. 2002, La Caracolera, Cortijo de la Palomera, Borosa river, Atalaya mountain, Spain); *Aristolochio baeticae-Arbutetum unedonis* (Pinto-Gomes & Cano in Torres et al. 2002, Estoì, Querença, Portugal; Sierra de Lujar, Órgiva, and Almijara, Otivar, Granada, Spain). In conclusione, il nostro studio mira a (1) fornire un inquadramento fitosociologico coerente della vegetazione arbustiva a *Bupleurum fruticosum* nell'area mediterranea, (2) analizzare la struttura e la composizione flostica; (3) e, infine, fornire maggiori informazioni sull'ecologia e il dinamismo delle comunità a *Bupleurum fruticosum*.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Fagus sylvatica woodlands on Mt. Etna: diachronic analysis and conservation

Ranno V. [1]*, *Sciandrello S*[1]., *Minissale P.* [1], *Meireles C.* [2], *Pinto Gomes C.*[2], *Tavilla G.* [1], *Gianpietro Giusso del Galdo*[1]

[1] Department of Biological, Geological and Environmental Sciences, University of Catania, Catania, Italy
[2] MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute, Escola de Ciências e Tecnologia, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal

*Corresponding author: veronica.ranno@phd.unict.it

The European beech, *Fagus sylvatica* L., is one of the most significant and widely distributed broadleaved trees in Europe. Its natural range reaches Sicily in the south, Spain in the west, and northwest Turkey in the east. The *Fagus sylvatica* forests are considered of primary conservation interest (9210* Apennine beech forests with *Taxus* and *Ilex*) and are legally protected under the European Habitats Directive (EU Directive 92/43/EEC; Annexe I). In Sicily, beech woodlands occur in the northern mountain massif, between 1500 and 2000 m of altitude, on valleys and slopes facing north, in cool and shady conditions. These forests, that support a wide variety of plants species and habitats, are in strong decline from a structural and functional point of view due to the ongoing climate change. The Mount Etna, the highest (3357m a.s.l.) active volcano in Europe, hosts the southernmost beech woodlands of EU which are more susceptible to climate change. Our research aims to investigate and quantify the *F. sylvatica* woodlands of Mt. Etna changes over time, through literature data, GIS tools and vegetation analysis. The method used resulted in new and detailed data about the Etnean distribution of the European beech. These outcomes can be useful for the conservation and management policies of Mount Etna Park.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

I boschi a *Fagus sylvatica* dell'Etna: analisi diacronica e conservazione

Ranno V. [1], Sciandrello S[1]., Minissale P. [1], Meireles C. [2], Pinto Gomes C.[2], Tavilla G. [1], Gianpietro Giusso del Galdo[1]*

[1] Department of Biological, Geological and Environmental Sciences, University of Catania, Catania, Italy
[2] MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute, Escola de Ciências e Tecnologia, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal

*Corresponding author: veronica.ranno@phd.unict.it

Il faggio europeo, *Fagus sylvatica* L., è una delle latifoglie più importanti e diffuse in Europa. Il suo areale di distribuzione raggiunge la Sicilia a sud, la Spagna a ovest e la Turchia nord-occidentale a est. Le foreste di *Fagus sylvatica* sono considerate habitat primari di conservazione (9210* faggete appenniniche con Taxus e Ilex) e sono giuridicamente protette ai sensi della Direttiva Habitat (Direttiva UE 92/43/CEE; Allegato I). In Sicilia le faggete sono presenti nel massiccio montuoso settentrionale, tra 1500 e 2000 m di quota, su valli e versanti esposti a nord, in condizioni fresche e ombrose. Queste foreste, che ospitano un'ampia varietà di specie vegetali e habitat, sono in forte declino dal punto di vista strutturale e funzionale a causa dei cambiamenti climatici in corso. L'Etna, il vulcano attivo più alto d'Europa (3357 m s.l.m.), ospita le faggete più meridionali dell'UE, e quindi più suscettibili ai cambiamenti climatici. La nostra ricerca mira a indagare e quantificare i cambiamenti delle foreste a *F. sylvatica* dell'Etna nel tempo, attraverso dati di letteratura, strumenti GIS e analisi della vegetazione. Il metodo utilizzato ha prodotto dati nuovi e dettagliati sulla distribuzione etnea del faggio europeo. Questi risultati possono essere utili per le politiche di conservazione e gestione del Parco dell'Etna.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

The vegetation of the Algerian coast: biodiversity, syntaxonomy and conservation

Siab-Farsi B.[1], Kadid Y.[1], Khelifi H.[1], Bouzahar C.[1,2]*
[1] Conservation, Management and Improvement of Forest Ecosystems Laboratory. National Higher School of Agronomy, Algiers, Algeria
[2] Univ of Western Brittany, EA 2219 Geoarchitecture F 29200, Brest, France

*Corresponding author: badia.farsi@edu.ensa.dz

Coastal environments correspond to geomorphological complexes encompassing different natural and semi-natural habitats. Dune massifs, rear dune depressions, pebble ridges, rocky slabs, maritime cliffs and coastal plains, constitute as many special refuges as possible for several plant species with high heritage value (Farsi, 2003; Khelifi, Bioret & Siab-Farsi, 2008, Khelifi, 2008).
Coveted for their ecological, landscape and cultural wealth, these fragile and varied environments are the seat of intense economic activity which acts directly or indirectly on this biodiversity and its ability to cope with environmental change.
The studies concerning the vegetation of the coast in Algeria are few if we consider the importance of the coastal strip which is spread over 1622 km and the diversity of the resulting habitats. We can retain the works of Nègre (1964), Thomas (1968), Alcaraz (1979) and those more recent of Géhu et al. (1992, 1994).
The main objective of our work is the evaluation of the phytodiversity of the Algerian coast, an updating of the data, with a contribution to the knowledge of phytocenoses and rare and endemic species, on which can be based orientations in terms of management and restoration of the biodiversity that constitutes our natural heritage.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Les végétations du littoral algérien: biodiversité, syntaxonomie et conservation

Siab-Farsi B.[1], Kadid Y.[1], Khelifi H.[1], Bouzahar C.[1,2]*

[1] Conservation, Management and Improvement of Forest Ecosystems Laboratory. National Higher School of Agronomy, Algiers, Algeria
[2] Univ of Western Brittany, EA 2219 Geoarchitecture F 29200, Brest, France

*Corresponding author: badia.farsi@edu.ensa.dz

Les milieux littoraux correspondent à des complexes géomorphologiques englobant différents habitats naturels et semi-naturels. Massifs dunaires, dépressions arrière dunaires, cordons de galets, dalles rocheuses, falaises maritimes et plaines littorales, constituent autant de refuges particuliers pour plusieurs espèces végétales à forte valeur patrimoniale (Farsi, 2003; Khelifi, Bioret & Siab-Farsi, 2008, Khelifi, 2008).
Convoités pour leurs richesses écologiques, paysagères et culturelles, ces milieux aussi fragiles que variés sont le siège d'une intense activité économique qui agit de façon directe ou indirecte sur cette biodiversité et sur sa capacité à faire face aux changements environnementaux.
Les études ayant concerné la végétation du littoral en Algérie sont peu nombreuses si l'on considère l'importance du linéaire côtier qui s'étale sur 1622 km et la diversité des habitats qui en résulte. On peut retenir les travaux de Nègre (1964), Thomas (1968), d'Alcaraz (1979) et ceux plus récents de Géhu et al. (1992, 1994).
Le principal objectif de notre travail est l'évaluation de la phytodiversité du littoral algérien, une actualisation des données, avec une contribution à la connaissance des phytocénoses et des espèces rares et endémiques, sur lesquelles pourront se baser des orientations en matière de gestion et de restauration de la biodiversité qui constitue notre patrimoine naturel.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Ecological landscape assessment through the analysis of Carta Natura habitats: Southern Calabria case study

Morabito A., Musarella C.M., Spampinato G.*

Dipartimento di AGRARIA - Università "Mediterranea" di Reggio Calabria, Località Feo di Vito, 89122 Reggio Calabria. (Italy).

*Corresponding author: antonio.morabito@unirc.it

The mapping of habitats and the assessment of their conservation status is crucial for spatial planning and management of natural resources. The "Carta Natura" is an important Territorial Information Systems in GIS areas for the knowledge of biodiversity, provided by the Italian State and in the framework law on protected areas (L. 394 of 1991). It makes it possible to assess the conservation status of ecosystems, estimate the ecological value of mapped units (habitats), and assess their environmental criticality similarly in all Italian regions. In addition, it is useful to identify ecological connection areas for an effective design of the Ecological Network. In Calabria, the Land Use map, provided by the Regional Administration ("Carta dei Luoghi" alla scala 1:5000), was the starting point for representing the habitats of the Natura Map. The drawing up of the map and the verifications were initiated with GIS tools and field activities carried out with two types of surveys: quick surveys with recognition of the species characterising the habitat and the taking of photos, and surveys of the vegetation of the habitat using the phytosociological method. A Nature Map database has been developed for habitat coding; it will be used in the organization of the Nature Map Legend. For the assessment of ecological integrity (EI) at landscape level, several indicators were considered: naturalness, habitat fragmentation, diversity of habitat types, dominant habitat types. Naturalness was assessed through the Landscape Conservation Index (LCI), which varies between 0 and 1 and is proportional to the importance of the natural habitats conserved. The results of these indicators elaborated by the GIS are compared with those obtained from a different approach, in which the conservation status of habitats is assessed through a series of indices that, using phytosociological surveys, take into account the floristic composition of habitats, such as the Ecological Maturity Index (EIM), the Maturity Index (IM) and life form indices, that can provide an effective and reliable tool for assessing the ecological integrity of different landscapes. The methodology based on habitat analysis has proven to be an effective and reliable tool for assessing the conservation of different landscapes.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Valutazione ecologica del paesaggio attraverso l'analisi degli habitat di Carta Natura: caso studio della Calabria Meridionale

*Morabito A. *, Musarella C.M., Spampinato G.*

Dipartimento di AGRARIA - Università "Mediterranea" di Reggio Calabria, Località Feo di Vito, 89122 Reggio Calabria. (Italy). antonio.morabito@unirc.it

*Corresponding author: antonio.morabito@unirc.it

La cartografia degli habitat e la valutazione del loro stato di conservazione è essenziale per la pianificazione territoriale e la gestione delle risorse naturali. La Carta della Natura è un importante sistema informativo territoriale per la conoscenza della biodiversità, previsto dallo Stato italiano e nella legge quadro sulle aree protette (L. 394 del 1991). Essa consente di valutare lo stato di conservazione degli ecosistemi e di stimare il valore ecologico delle unità mappate (habitat) e di valutarne le criticità ambientali in modo analogo in tutte le regioni italiane. Inoltre, è utile individuare aree di connessione ecologica per una progettazione efficace della Rete Ecologica Regionale. In Calabria, la Carta dell'Uso del Territorio, fornita dall'Amministrazione Regionale ("Carta dei Luoghi" alla scala 1:5000), ha rappresentato il punto di partenza per rappresentazione degli habitat di Carta Natura. La realizzazione della carta e le verifiche sono state avviate con strumenti GIS e con attività di campo svolte con due tipologie di rilievi: rilievi speditivi con riconoscimento delle specie caratterizzanti l'habitat e foto e rilievi della vegetazione dell'habitat con metodo fitosociologico. Per la codifica dell'habitat è stato sviluppato un database della Carta della Natura che sarà utilizzato nell'organizzazione della Legenda della Carta della Natura. Per la valutazione dell'integrità ecologica (EI) a livello di paesaggio sono stati presi in considerazione diversi indicatori: naturalità, frammentazione dell'habitat, diversità di tipi di habitat, tipo di habitat dominante. La naturalità è stata valutata attraverso l'indice di conservazione del paesaggio (ILC), che varia da 0 e 1 ed è proporzionale all'importanza degli ambienti naturali conservati. I risultati di questi indicatori elaborati dal GIS sono confrontati con quelli ottenuti da un diverso approccio, in cui lo stato di conservazione degli habitat viene valutato attraverso una serie e indici che, utilizzando i rilievi fitosociologici, tengono conto della composizione floristica di habitat, come l'Indice di Maturità Ecologica (EIM), l'Indice di Maturità (IM) e gli indici delle forme di vita può fornire uno strumento efficace e affidabile per valutare l'integrità ecologica di diversi paesaggi. La metodologia basata sull'analisi degli habitat si è dimostrata uno strumento efficace e affidabile per la valutazione della conservazione di diversi paesaggi.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Determination of the importance of the geology in the biodiversity using remote sensing and image processing in Chelid basins, Algeria

Souhila C.[1, 2,3, *], *Bezzeghoud M.* [1, 4], *Tlemcani M.*[1, 2], *Pinto Gomes C.*[1,5]

[1]Institute of Earth Science (ICT) University of Évora 7000 Évora Portugal
[2]Department of Mechatronics Engineering (ECT) of University of Évora 7000 Évora Portugal
[3]Centre of Engineering and Product Development (CEiiA)/ Chair of Aerospace Sciences and Technology
[4]Department of Physics (ECT) of University of Évora 7000 Évora Portugal
[5]Mediterranean Institute for Agriculture MED

*Corresponding author: souhila.chabane@uevora.pt

Given the rapidity of global climate change and the significant time needed to identify changes in biodiversity in situ. An innovative and faster method is eligible to minimize study time, as well as to better understand the role of the different parameters influencing this change. This study will focus on the nature and quality of soils, which play an important role in biodiversity variation.
There is a direct relationship between geodiversity and biodiversity. Where we can observe that Geology influences in the climate and the substratum. The global pattern of continents (a consequence of plate tectonics) influences global weather. Mountain chains affect regional weather patterns and aspects can determine microclimate.
Our study area will be in the Chelif Neogene basins of northwestern Algeria. It is located between the littoral massifs (Murdjadjo, Orousse, and Dahra) in the north and the Tessala.
Mountains, Ouled Ali, Béni Chougrane, and Ouarsenis in the south. Algeria's particular geographical position in the Mediterranean region has resulted in a great diversity of biotopes occupied by a significant wealth of flora.
The overall objective of this work is to determine the importance of geology in biodiversity using image processing and remote sensing methodology combined with existing work and literature. However, we will also focus on the role of urbanization in the variation and modification of plant biotopes. Our work will be divided into three important phases.
i) determination of vegetation and soil types based on literature in our study area;
ii) image processing study to determine the type, location, and density of vegetation (other elements may be added in the future) at different times (1945/1973/1980/200 and present) and after a major geological and natural event (earthquake, liquefaction, fire, inundation, landslide) to determine and analyze their evolution and the different influencing parameters;
iii) creation of various maps with the following information type of vegetation, type of soil according to vegetation, their spatiotemporal location and distribution.
The advantage of this new study method using machine learning and image processing is the ability to produce detailed maps about the geology, the vegetation, and the urbanization including different geological and natural parameters or/ and majors event in different periods of time, also determines the principal influencing factor.
As a synthesis, we can create a simulation about the influence of each parameter on the quality and the quantity of vegetation and soil nature.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Determinação da importância da geologia na biodiversidade utilizando a detecção remota e o tratamento de imagens nas bacias do Chelif, Argélia

Souhila C.[1, 2,3,], Bezzeghoud M. [1, 4], Tlemcani M.[1, 2], José Pinto Gomes C.[1,5]*

[1]Institute of Earth Science (ICT) University of Évora 7000 Évora Portugal
[2]Department of Mechatronics Engineering (ECT) of University of Évora 7000 Évora Portugal
[3]Centre of Engineering and Product Development (CEiiA)/ Chair of Aerospace Sciences and Technology
[4]Department of Physics (ECT) of University of Évora 7000 Évora Portugal
[5]Mediterranean Institute for Agriculture MED

*Corresponding author: souhila.chabane@uevora.pt

Dada a rapidez das alterações climáticas globais e o tempo significativo necessário para identificar alterações na biodiversidade in situ. Um método inovador e mais rápido é elegível para minimizar o tempo de estudo e compreender melhor o papel dos diferentes parâmetros que influenciam esta mudança. Este estudo centrar-se-á na natureza e na qualidade dos solos, que são essenciais para a variação da biodiversidade.
Existe uma relação directa entre a geodiversidade e a biodiversidade. Onde podemos observar que a geologia influencia o clima e o substrato. O padrão global dos continentes (uma consequência da tectónica de placas) influencia o clima global. As cadeias montanhosas afectam os padrões climáticos regionais e os aspectos podem determinar o microclima.
A nossa área de estudo situa-se nas bacias neogénicas de Chelif, no noroeste da Argélia. Situa-se entre os maciços litorais (Murdjadjo, Orousse e Dahra) a norte e as montanhas de Tessala, Ouled Ali, Béni Chougrane e Ouarsenis a sul. A posição geográfica particular da Argélia na região mediterrânica traduziu-se numa grande diversidade de biótopos ocupados por uma riqueza significativa de flora.
O objectivo geral deste trabalho é determinar a importância da geologia na biodiversidade, utilizando metodologias de processamento de imagem e de detecção remota combinadas com o trabalho e a literatura existentes. No entanto, também nos iremos focar no papel da urbanização na variação e modificação dos biótopos vegetais. O nosso trabalho será dividido em três fases importantes.
i) determinação dos tipos de vegetação e de solo com base na literatura da nossa área de estudo;
ii) estudo de processamento de imagem para determinar o tipo, a localização e a densidade da vegetação (outros elementos podem ser adicionados no futuro) em diferentes momentos (1945/1973/1980/200 e presente) e após um grande evento geológico e natural (terramoto,
liquefacção, incêndio, inundação, deslizamento de terras) para determinar e analisar a sua evolução e os diferentes parâmetros que influenciam;
iii) criação de vários mapas com a seguinte informação tipo de vegetação, tipo de solo de acordo com a vegetação, sua localização espácio-temporal e distribuição.
A vantagem deste novo método de estudo que utiliza a aprendizagem automática e o processamento de imagens é a capacidade de produzir mapas detalhados sobre a geologia, a vegetação e a urbanização, incluindo diferentes parâmetros geológicos e naturais ou/e eventos importantes em diferentes períodos de tempo, o que também determina o principal factor de influência.
Como síntese, podemos criar uma simulação sobre a influência de cada parâmetro na qualidade e quantidade de vegetação e natureza do solo.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Ecological and syntaxonomic analysis of the communities of *Malvion neglectae* in the western mediterranean

Cano E. [1]*, *Cano-Ortiz A.*[2], *Musarella C.M.*[3], *Quinto Canas R.*[4], *Piñar Fuentes J.C.*[1], *Meireles C.*[5], *Raposo M.*[5], *Pinto Gomes C.J.*[5], *Spampinato G.*[3]

[1]Department of Animal and Plant Biology and Ecology, Section of Botany, University of Jaén, Jaén, Spain
[2]Department of Didactics of Experimental, Social and Matematical Sciences. UCM, Madrid, Spain
[3]Department of AGRARIA, "Mediterranea" University of Reggio Calabria, Reggio Calabria, Italy
[4] Faculty of Sciences and Technology, University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal. Centre of Marine Sciences (CCMAR), University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal.
[5]Department of Landscape, Environment and Planning, Instituto Mediterrâneo para a Agricultura, Ambiente e Desenvolvimento (**MED**), Escola de Ciências e Tecnologia. University of Évora (Portugal), Évora, Portugal.

*Corresponding author: ecano@ujaen.es

The communities of nitrified grasslands rich in Chenopodium murale, Malva parviflora, Malva neglecta Chrysanthemum coronarium, Hordeum leporinum have been studied by different authors. Gutte (1966) already proposes the Malva neglecta communities in the Malvenion neglectae suballiance, and later Rivas-Martínez (1978a) proposes the Malvenion parviflorae suballiance; years later Rivas-Martínez et al. (2001) include the Urtico urentis-Malvetum neglectae communities in the suballiance described by Gutte, and 8 associations in Malvenion parviflorae, subordinating both suballiances to the Chenopodion muralis alliance. Both authors make exhaustive studies from the phytosociological point of view, but do not provide edaphic data. Subsequently, a group of nitrophilic associations are studied (Cano-Ortiz 2007; Cano-Ortiz et al. 2009), from the phytosociological and edaphic point of view; among the syntaxa studied are the grasslands of Malva neglecta, Malva parviflora, Urtica urens, Chyrsanthemum coronarium and Hordeum leporinum. More recently Cano-Ortiz et al. (2014) carry out a study on the Hordeion leporini alliance in the Western Mediterranean, for which they provide inventories from Greece, Italy, Morocco, Spain and Portugal. In said study, due to the similarity in terms of the ecology and distribution of Malva neglecta and Malva parviflora, the authors state that considering the edaphic parameters and distribution of both Malva species, and having priority of name, the sub-alliance described by Gutte should be maintain the Malvenion neglectae suballiance with its new alliance rank Malvión neglectae (Gutte 1966) Cano-Ortiz et al 2014. Due to the doubts raised about the taxonomy of Chrysanthemum coronarium Cano et al. (2017) carry out the taxonomic study of Chrysanthemum coronarium var. concolor and var. discolor, and establish the taxa Glebionis coronaria and Glebionis discolor. Based on this new taxonomy, we establish a new syntaxonomy for the Glebionis communities, being included in the Resedo albae-Glebionenion coronariae sub-alliance (Cano-Ortiz et al 2014) nom. corr. (articles 43,44) ICPN (Theurillat et al. 2021), which is subordinate to Malvion neglectae. We include in this sub-alliance several associations of which we propose 5 new ones.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Análisis ecológico y sintaxonómico de las comunidades de *Malvion neglectae* en el mediterráneo occidental

Cano E. [1]*, *Cano-Ortiz A.*[2], *Musarella C.M.*[3], *Quinto Canas R.*[4], *Piñar Fuentes J.C.*[1], *Meireles C.*[5], *Raposo M.*[5], *Pinto Gomes C.J.*[5], *Spampinato G.*[3]

[1]Department of Animal and Plant Biology and Ecology, Section of Botany, University of Jaén, Jaén, Spain
[2]Department of Didactics of Experimental, Social and Matematical Sciences. UCM, Madrid, Spain
[3]Department of AGRARIA, "Mediterranea" University of Reggio Calabria, Reggio Calabria, Italy
[4] Faculty of Sciences and Technology, University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal. Centre of Marine Sciences (CCMAR), University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal.
[5]Department of Landscape, Environment and Planning, Instituto Mediterrâneo para a Agricultura, Ambiente e Desenvolvimento (**MED**), Escola de Ciências e Tecnologia. University of Évora (Portugal), Évora, Portugal.

*Corresponding author: ecano@ujaen.es

Las comunidades de herbazales nitrificados ricas en *Chenopodium murale*, *Malva parviflora*, *Malva neglecta Chrysanthemum coronarium*, *Hordeum leporinum* han sido estudiadas por diferentes autores. Ya Gutte (1966) propone las comunidades *Malva neglecta* en la subalianza *Malvenion neglectae*, y posteriormente Rivas-Martínez (1978a, b) propone la subalianza *Malvenion parviflorae*; años después Rivas-Martínez et al. (2001) incluyen las comunidades de *Urtico urentis-Malvetum neglectae* en la subalianza descrita por Gutte, y 8 asociaciones en *Malvenion parviflorae*, subordinando ambas subalianzas a la alianza *Chenopodion muralis.* Ambos autores hacen estudios exhaustivos desde el punto de vista fitosociológico, pero no aportan datos edáficos. Posteriormente se estudian un grupo de asociaciones de carácter nitrófilo (Cano-Ortiz 2007; Cano-Ortiz et al. 2009), desde el punto de vista fitosociológico y edáfico; entre los sintaxones estudiados se encuentran los herbazales de *Malva neglecta, Malva parviflora, Urtica urens*, *Chyrsanthemum coronarium* y *Hordeum leporinum*. Más recientemente Cano-Ortiz et al. (2014) realiza un estudio sobre la alianza *Hordeion leporini* en el Mediterráneo Occidental, para ello aporta inventarios de Grecia, Italia, Marruecos, España y Portugal. En dicho estudio debido a la similitud en cuanto a la ecología y distribución de *Malva neglecta* y de *Malva parviflora* los autores expresan que atendiendo a los parámetros edáficos y distribución de ambas especies de *Malva*, y teniendo prioridad de nombre la subalianza descrita por Gutte se debe mantener la subalianza *Malvenion neglectae* con su nuevo rango de alianza *Malvión neglectae* (Gutte 1966) Cano-Ortiz et al 2014. Debido a las dudas suscitadas sobre la taxonomía de *Chrysanthemum coronarium* Cano et al. (2017) realizan el estudio taxonómico de *Chrysanthemum coronarium var. concolor* y var. *discolor*, y establecen las taxones *Glebionis coronaria* y *Glebionis discolor*. En base a esta nueva taxonomía establecemos una nueva sintaxonomía para las comunidades de *Glebionis* quedando incluidas en la subalianza *Resedo albae-Glebionenion coronariae* (Cano-Ortiz et al 2014) nom. corr. (articles 43,44) ICPN (Theurillat et al. 2021), que está subordinada a *Malvion neglectae.* Incluimos en esta subalianza varias asociaciones de las cuales proponemos 5 nuevas.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Edaphic and topographic filtering of plant life forms in Mediterranean mountaintop communities

Marcenò C.[1], Gristina A.S.[2], Ilardi V.[3], Chytrý M.[4], Garfì G.[5], Jiménez-Alfaro B.[6], Kozlowski G.[7], Laudicina V.A.[8], Paliaga S.[8], Pasta S.[5], Venanzoni R.[1], Guarino R.[3]*

[1] Department of Chemistry, Biology and Biotechnology, University of Perugia, Italy
[2]Department DISTEM, University of Palermo, Palermo, Italy
[3]Botanical Unit, Department STEBICEF, University of Palermo, Palermo, Italy
[4]Department of Botany and Zoology, Faculty of Science, Masaryk University, Brno, Czech Republic
[5] Institute of Biosciences and BioResources (IBBR), National Research Council (CNR), Palermo, Italy
[6]Research Unit of Biodiversity (UO/CSIC/PA), Oviedo University, Mieres, Spain
[7]Department of Biology and Botanic Garden, University of Fribourg, Fribourg, Switzerland
[8]Department of Agriculture, Food and Forest Sciences, University of Palermo, Palermo, Italy

*Corresponding author: corrado.marceno@unipg.it

Environmental drivers filtering life forms at local scales are poorly investigated in general, and studies devoted to this topic in the Mediterranean mountains are still missing. We investigated the role of edaphic and topographic gradients in vegetation above 1900 m a.s.l. on Pizzo Carbonara (Madonie Mountains, Northern Sicily), a carbonate massif extensively affected by karst erosion that gave rise to a system of sinkholes and windy ridges alternating on the summit plateau. We sampled 42 vegetation plots, georeferenced with a sub-metric GPS. Different topographic variables were derived from the regional technical map of Sicily, with 2 m resolution, using QGIS. Additionally, several chemical and biochemical soil parameters were analysed for each plot. The species were split into three life-form groups: chamaephytes, hemicryptophytes, and therophytes. Data were analysed using different response variables: species richness, vegetation cover, and species composition. For the first two response variables, a Generalised Linear Model (GLM) was run. The compositional data were processed by distance-based redundancy analysis (db-RDA) through variation partitioning. Results show that life forms are subject to differential filtering by edaphic and topographic variables. These topographic conditions affect the relative performance of the co-occurring vascular plant species, and consequently, the structure and composition of local plant communities.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Influenza dei fattori edafici e topografici sulle forme biologiche nelle comunità montane Mediterranee

Marcenò C.[1], Gristina A.S.[2], Ilardi V.[3], Chytrý M.[4], Garfì G.[5], Jiménez-Alfaro B.[6], Kozlowski G.[7], Laudicina V.A.[8], Paliaga S.[8], Pasta S.[5], Venanzoni R.[1], Guarino R.[3]*

[1] Department of Chemistry, Biology and Biotechnology, University of Perugia, Italy
[2]Department DISTEM, University of Palermo, Palermo, Italy
[3]Botanical Unit, Department STEBICEF, University of Palermo, Palermo, Italy
[4]Department of Botany and Zoology, Faculty of Science, Masaryk University, Brno, Czech Republic
[5] Institute of Biosciences and BioResources (IBBR), National Research Council (CNR), Palermo, Italy
[6]Research Unit of Biodiversity (UO/CSIC/PA), Oviedo University, Mieres, Spain
[7]Department of Biology and Botanic Garden, University of Fribourg, Fribourg, Switzerland
[8]Department of Agriculture, Food and Forest Sciences, University of Palermo, Palermo, Italy

*Corresponding author: corrado.marceno@unipg.it

I fattori ambientali che influenzano le forme biologiche a scala locale sono in generale poco studiati e per le montagne Mediterranee mancano del tutto studi specifici. Abbiamo analizzato il ruolo dei gradienti edafici e topografici della vegetazione alto montana, sopra i 1900 m s.l.m., di Pizzo Carbonara (Madonie, Sicilia Settentrionale), massiccio carbonatico ampiamente interessato dall'erosione carsica che ha dato origine ad un sistema di doline e creste che si alternano sul pianoro sommitale. Abbiamo effettuato 42 rilevamenti della vegetazione, georeferenziati con un GPS submetrico. Diverse variabili topografiche sono state derivate dalla carta tecnica regionale della Sicilia utilizzando QGIS. Per ciascun'area di rilevamento sono stati analizzati diversi parametri chimici e biochimici del suolo. Le specie sono state suddivise in tre gruppi di forme biologiche: camefite, emicriptofite e terofite. I dati sono stati analizzati utilizzando diverse variabili di risposta: ricchezza specifica, copertura vegetale e composizione delle specie. Per le prime due variabili di risposta è stato eseguito un Generalised Linear Model (GLM). I dati di composizione sono stati elaborati mediante Redundancy Analysis (db-RDA) e Variation Partitioning (VP). I risultati mostrano che le forme biologiche vengono differentemente filtrate dai fattori edafici e topografici, che a loro volta influenzano la performance relativa delle piante vascolari, e di conseguenza, la struttura e la composizione delle comunità vegetali locali.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

A phytosociological overview on the *Poterium spinosum* communities in Italy

*Genduso E.[1] *, Sciandrello S.[2], Tavilla G.[2], Minissale P.[2], Bacchetta G.[3], Spampinato G.[4], Musarella C.M.[4], Laface V.L.A.[4], Costanzo E.[5], Tomaselli V.[1]*

[1] Department of Biosciences, Biotechnologies and Environment (DBBA), University of Bari Aldo Moro, Via Orabona 4, 70125 Bari, Italy
[2] Department of Biological, Geological and Environmental Sciences, University of Catania, Via A. Longo 19, I-95125 Catania, Italy
[3] Centre for the Conservation of Biodiversity (CCB), Department of Life and Environmental Sciences, University of Cagliari, Viale Sant'Ignazio da Laconi 13, 09123 Cagliari, Italy
[4] Department of Agraria, "Mediterranea" University of Reggio Calabria, Cittadella Universitaria, Località Feo di Vito, 89122 Reggio Calabria (RC), Italy
[5] Institute of Atmospheric pollution Research, National Research Council (CNR IIA), Secondary office in Bari, c/o Department of Physics**,** University of Bari Aldo Moro, Via Orabona 4, 70125 Bari, Italy

*Corresponding author: emanuele.genduso@uniba.it

Poterium spinosum L. is a SE-Mediterranean species widely distributed in Middle Eastern countries, and in Cyprus, Crete, Greece, Albania, Croatia, Tunisia, Libya, Malta and Italy. In Italy this species has a discontinuous to scattered distribution in Apulia, Basilicata, Calabria, Sicily and Sardinia, where it finds the western limit of its distributional range. According to the IUCN criteria, it is classified as "Endangered" (EN) at the national level (Gargano et al. 2007). *Poterium spinosum* communities form garrigues with a phrygana-like structure and characterize the EU habitat type 5420 - "Sarcopoterium spinosum phryganas" (Biondi et al. 2009). Although several studies have been carried out on these communities at regional or local level, a synthesis of this vegetation type at the national level is still lacking. Based on a multivariate analysis of both literature and unpublished relevés, this survey aims to provide a comprehensive and up-to-date framework of *P. spinosum* communities in Italy.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Una panoramica fitosociologica sulle comunità di *Poterium spinosum* in Italia

*Genduso E.[1] *, Sciandrello S.[2], Tavilla G.[2], Minissale P.[2], Bacchetta G.[3], Spampinato G.[4], Musarella C.M.[4], Laface V.L.A.[4], Costanzo E.[5], Tomaselli V.[1]*

[1] Department of Biosciences, Biotechnologies and Environment (DBBA), University of Bari Aldo Moro, Via Orabona 4, 70125 Bari, Italy
[2] Department of Biological, Geological and Environmental Sciences, University of Catania, Via A. Longo 19, I-95125 Catania, Italy
[3] Centre for the Conservation of Biodiversity (CCB), Department of Life and Environmental Sciences, University of Cagliari, Viale Sant'Ignazio da Laconi 13, 09123 Cagliari, Italy
[4] Department of Agraria, "Mediterranea" University of Reggio Calabria, Cittadella Universitaria, Località Feo di Vito, 89122 Reggio Calabria (RC), Italy
[5] Institute of Atmospheric pollution Research, National Research Council (CNR IIA), Secondary office in Bari, c/o Department of Physics**,** University of Bari Aldo Moro, Via Orabona 4, 70125 Bari, Italy

*Corresponding author: emanuele.genduso@uniba.it

Poterium spinosum L. è una specie a distribuzione SE-Mediterranea ampiamente diffusa nella regione del Medio-Oriente, presente anche in Cipro, Creta, Grecia, Albania, Croazia, Tunisia, Libia, Malta e Italia. In Italia questa specie è presente con una distribuzione da discontinua a frammentata in Puglia, Basilicata, Calabria, Sicilia e Sardegna, dove raggiunge il limite occidentale del proprio areale. In accordo con i criteri della IUCN, è classificata come "In Pericolo" (EN) a livello nazionale (Gargano et al. 2007). Le comunità a *P. spinosum* formano garighe tipo frigana e caratterizzano l'Habitat EU 5420 - "frigane a Sarcopoterium spinosum" (Biondi et al. 2009). Sebbene siano stati condotti diversi studi a livello regionale e locale relativi a queste comunità, manca ancora una sintesi a livello nazionale. Sulla base di analisi multivariate applicate a rilievi fitosociologici pubblicati in letteratura e inediti, l'indagine ha lo scopo di fornire un quadro comprensivo e aggiornato sugli aspetti a *P. spinosum* in Italia.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Invasive non-native trees in Natura2000 sites of Sicily: relevance and management issues

Badalamenti E., Barone S., Sala G., La Mantia T.*

Department of Agricultural, Food and Forest Sciences, University of Palermo, Viale delle Scienze, Ed.4, 90128 Palermo, Italy

*Corresponding author: emilio.badalamenti@unipa.it

Invasive non-native trees (INNTs) are an ever-increasing component of natural and seminatural communities worldwide. However, for the high competitive ability of INNTs and their tendency to cover and dominate over large areas, such a trend is commonly associated with a reduction of biodiversity along with a simplification and banalization of ecosystems. These detrimental ecological effects are likely to impact more on protected sites, established with the main aim to preserve native ecosystems and species. In this general framework, we assessed the abundance and spread of the main INNTs occurring in the Special Areas of Conservation of Sicily, being part of the Natura2000 network and designed according to the Habitats Directive (92/43/EEC). In particular, we accessed the management plans of all SACs present in Sicily, that is about 200 protected sites. We selected the INNTs having a higher ability to invade natural and seminatural habitats in Sicily, including forest systems: *Ailanthus altissima, Acacia saligna, Eucalyptus camaldulensis, Parkinsonia aculeata, Robinia pseudoacacia* and *Vachellia karroo*. We also took into consideration the inclusion in the list of invasive alien species of Union concern pursuant to Regulation (EU) 1143/2014. Within the management plans, we found three main information types concerning INNTs: presence/absence, abundance level and invasiveness status. The results of the research will help to identify the most widespread INNTs as well as some patterns of tree invasion in Natura 2000 sites of Sicily. Furthermore, we assessed whether well-known invasive tree species are adequately considered as serious threats in the management efforts addressed to biodiversity conservation in protected sites of Sicily.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Alberi alloctoni invasivi nei siti Natura2000 della Sicilia: rilevanza e problematiche gestionali

Badalamenti E., Barone S., Sala G., La Mantia T.*

Department of Agricultural, Food and Forest Sciences, University of Palermo, Viale delle Scienze, Ed.4, 90128 Palermo, Italy

*Corresponding author: emilio.badalamenti@unipa.it

Gli alberi invasivi alloctoni sono una componente sempre crescente delle comunità naturali e seminaturali in tutto il mondo. Tuttavia, per la loro elevata capacità competitiva e per la loro tendenza a coprire vaste aree ed a dominarle, tale tendenza è comunemente associata a una riduzione della biodiversità insieme a una semplificazione e banalizzazione degli ecosistemi. È probabile che questi effetti ecologici dannosi abbiano un impatto maggiore sui siti protetti, istituiti con l'obiettivo principale di preservare gli ecosistemi e le specie autoctone. In questo quadro generale, abbiamo valutato l'abbondanza e la diffusione dei principali alberi invasivi alloctoni presenti nelle Zone Speciali di Conservazione (ZSC) della Sicilia, facenti parte della rete Natura2000 e progettate secondo la Direttiva Habitat (92/43/CEE). In particolare, abbiamo consultato i piani di gestione di tutte le ZSC presenti in Sicilia, ovvero circa 200 siti protetti. Abbiamo scelto gli alberi alloctoni invasivi con una maggiore capacità di invadere habitat naturali e seminaturali in Sicilia, inclusi i sistemi forestali: *Ailanthus altissima, Acacia saligna, Eucalyptus camaldulensis, Parkinsonia aculeata, Robinia pseudoacacia* e *Vachellia karroo*. Abbiamo anche preso in considerazione la loro inclusione nell'elenco delle specie esotiche invasive di rilevanza unionale ai sensi del Regolamento (UE) 1143/2014. All'interno dei piani di gestione, abbiamo trovato tre principali tipi di informazioni riguardanti gli alberi alloctoni invasivi: presenza/assenza, livello di abbondanza e livello di invasività. I risultati della ricerca aiuteranno a identificare gli alberi alloctoni invasivi più diffusi e alcuni andamenti di invasione arborea nei siti Natura 2000 della Sicilia. Inoltre, abbiamo valutato se specie arboree invasive ben conosciute siano adeguatamente considerate come gravi minacce negli sforzi di gestione indirizzati alla conservazione della biodiversità nei siti protetti della Sicilia.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Understanding dynamics of coastal heathlands for their conservation

Glemarec E., Bioret F., Chevrollier C.*

Laboratoire Géoarchitecture, Université de Bretagne occidentale, Brest, France

*Corresponding author: erwan.glemarec@univ-brest.fr

Heathlands, habitats of community interest, are structured by chamaephytes and dwarf nano phanaerophytes dominated by Ericaceae (Gimingham et al., 1979) associated with Fabaceae (Ulex). They constitute low ligneous vegetation such as scrublands, "maquis" and certain *Cytisus* Mediterranean vegetation (Díaz Gonzales, 1998). Under marine influences, they present a physiognomy marked by halo-anemogenic forms (Géhu, 1975). Coastal heathlands are characterized by a biological diversity resulting from severe ecological constraints, which sometimes cause their stability. Some coastal heathlands could be considered as primary or climax vegetation (Loidi, 2021). In the Armorican Massif, the floristic compositions of the heathlands, bracken vegetation and grasslands are diverse and different dynamic trajectories do exist, some communities are blocked at the stage of non-tree vegetation.
However, traces of anthropogenic use are omnipresent on the Armorican coastlines. Cliff top coastal heathlands were integrated into peasant activity up to late XIXth century and have been maintained in certain sectors, in a peasant multi-livestock activity that lasted until the mid-XXth century.
While knowledge of the ecological determinism of coastal heathlands can help to the understanding of natural mechanisms, the historical and social dimensions seem to be essential.
We propose a multidisciplinary method, drawing inspiration from the historical ecology approach: anthracology, rural history and the study of old registers, socio-historical survey of agro-pastoral uses and landscape phytosociology. This multiple approach will clarify the vegetation dynamics for understanding the influence of past uses and the future of the maritime cliffs landscape.
This communication aims to show the research issues and the first results. A focus will be made on the cartographic study of a coastal cliff site, on the geoserial approach of the coastal heathlands, and their landscape dynamics (Glemarec & Bioret, *in press*). Inventory and diagnostic tool are proposed for survey and conservation management of maritime cliff sites (Glemarec & Bioret, *in press*).
The choice of nature and frequency of management methods seems important. Stable coastal heathlands, considered as permanent vegetation and having (sub)primary character, can be managed without any intervention, while coastal heathlands characterized by a natural progressive dynamic may be subject to interventionist management.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Comprendre les dynamiques des landes littorales pour leur gestion

Glemarec E., Bioret F., Chevrollier C.*

Laboratoire Géoarchitecture, Université de Bretagne occidentale, Brest, France

*Corresponding author: erwan.glemarec@univ-brest.fr

Les landes, habitats d'intérêt communautaire, sont structurées par des chaméphytes et nanophanérophytes bas dominées par des Ericaceae (Gimingham et al., 1979) associées à des Fabaceae (Ulex). Elles constituent des végétations basses comme les fourrés, "maquis" ou certaines végétations méditerranéennes à *Cytisus* (Díaz Gonzales, 1998). Sous conditions maritimes, elles présentent une physionomie marquée par des accommodats halo-anémogènes (Géhu, 1975). Les landes littorales sont caractérisées par une diversité biologique résultant de contraintes écologiques, qui parfois conditionnent leur stabilité. Certaines landes littorales sont considérées comme une végétation primaire ou climacique (Loidi, 2021). Dans le massif Armoricain, les compositions floristiques des landes, ptéridaies et pelouses sont diversifiées et des dynamiques différentes existent, certaines communautés étant bloquées au stade de végétation non arborée.
Cependant, des traces d'usages anthropiques sont omniprésentes sur le littoral armoricain. Les landes des sommets des falaises littorales étaient intégrées à la vie paysanne jusqu'à la fin du XIXème siècle et ont été , dans certains secteurs, maintenues dans une activité paysanne de multi-élevage qui a duré jusqu'au milieu du XXème siècle.
Si la connaissance du déterminisme écologique des landes littorales peut aider à la compréhension des mécanismes naturels, les dimensions historiques et sociales semblent essentielles.
Nous proposons une méthode pluridisciplinaire, s'inspirant de l'approche d'écologie historique : anthracologie, histoire rurale et étude des cadastres anciens, enquête socio-historique des usages agro pastoraux et phytosociologie du paysage. Cette approche multiple permettra de cerner les dynamiques végétales pour comprendre l'influence des usages passés et l'avenir du paysage des falaises maritimes.
Cette communication vise à montrer les enjeux de la recherche et les premiers résultats. Un focus sera mis sur l'étude cartographique d'un site de falaise littorale, sur l'approche géosériale des landes littorales et leur dynamique paysagère (Glemarec & Bioret, *in press*). Un outil d'inventaire et de diagnostic est proposé pour l'étude et la gestion conservatoire des sites de falaises maritimes (Glemarec & Bioret, *in press*).
Le choix de la nature et de la fréquence des modes de gestion semble important. Les landes littorales stables, considérées comme végétation permanente à caractère (sub)primaire, peuvent être gérées sans aucune intervention, tandis que les landes littorales caractérisées par une dynamique naturelle progressive peuvent faire l'objet d'une gestion interventionniste.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Priority habitats and checklist of the vascular plant communities of Algarve (Portugal)

Quinto Canas R.[1], Raposo M.[2], Cano-Ortiz A.[3], Musarella C.M.[4], Xarepe D.[1], Pinto Gomes C.[2]*

[1] Faculty of Sciences and Technology, University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal; CCMAR – Centre of Marine Sciences (CCMAR), University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal
[2] Department of Landscape, Environment and Planning, Mediterranean Institute for Agriculture, Environment and Development (MED), School of Science and Technology, University of Évora, Portugal, Rua Romão Ramalho, nº 59, 7000-671 Évora, Portugal
[3] Department of Animal and Plant Biology and Ecology, Section of Botany, University of Jaén. Las Lagunillas s/n, 23071 Jaén, Spain
[4] Department of AGRARIA, "Mediterranea" University of Reggio Calabria, Località Feo di Vito, 89122 Reggio Calabria, Italy

*Corresponding author: rjcanas@ualg.pt

In this work we present a checklist of all vegetation types occurring in southern Portugal (Algarve), based on our own relevés (and past works taken from literature. It aims to provide the updated of Braun-Blanquet syntaxonomy for vascular plant communities of Algarve, describing the nomenclatural types from class level to association, checked according to Rivas-Martínez et al. (2001, 2002, 2011), Costa et al. (2012) and Mucina et al. (2016). This information allows us to established a cross.
reference with the Annex I habitat types of the Directive 92/43/EEC (ALFA 2004), in order to obtain an imperative basis for nature conservation and monitoring in Algarve region. Furthermore, we identify the priority habitats types and species for conservation based on national and international protection catalogues (protection status), rarity and threats levels. This work features to improve the regional management options to protect and maintain priority habitats and areas of high conservation value through regulation, environmental planning instruments and assessment, recovery programs, and the priorities action statement under the threatened species conservation.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Habitats prioritários e checklist das comunidades de plantas vasculares do Algarve (Portugal)

Quinto Canas R.[1], Raposo M.[2], Cano-Ortiz A.[3], Musarella C.M.[4], Xarepe D.[1], Pinto Gomes C.[2]*

[1] Faculty of Sciences and Technology, University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal; CCMAR – Centre of Marine Sciences (CCMAR), University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal
[2] Department of Landscape, Environment and Planning, Mediterranean Institute for Agriculture, Environment and Development (MED), School of Science and Technology, University of Évora, Portugal, Rua Romão Ramalho, nº 59, 7000-671 Évora, Portugal
[3] Department of Animal and Plant Biology and Ecology, Section of Botany, University of Jaén. Las Lagunillas s/n, 23071 Jaén, Spain
[4] Department of AGRARIA, "Mediterranea" University of Reggio Calabria, Località Feo di Vito, 89122 Reggio Calabria, Italy

*Corresponding author: rjcanas@ualg.pt

Apresenta-se a checklist das comunidades de plantas vasculares que ocorrem no sul de Portugal (Algarve), pretendendo-se sistematizar o conjunto das associações vegetais ocorrentes na área estudada no contexto sintaxonómico de Braun-Blanquet, e respetivos sintáxones de categoria superior (classes, subclasses, ordens, subordens, alianças e sub alianças), seguindo Rivas-Martínez et al. (2001, 2002, 2011), Costa et al. (2012) and Mucina et al. (2016). Tal informação permitiu estabelecer a correspondência fitossociológica das associações vegetais com os habitats publicados pela Diretiva n. º 92/43/CEE (ALFA 2004), com o objetivo de contribuir para a gestão e conservação da natureza na região do Algarve. Ademais, identificam-se os habitats prioritários e espécies raras, protegidas e com interesse para a conservação. Esta informação, em distintos níveis de complexidade, permitirá à comunidade científica e gestores do território delinear planos de intervenção, com o objetivo de promover medidas de gestão suscetíveis de contribuir para a manutenção e valorização da biodiversidade.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Multi-Level monitoring system for cork oak (*Quercus suber* L.) stands in Sicily

Sala G.[1], Sofia S.[1], Cassata S.[1], Santosuosso A.[2], La Mela Veca D.S.[1], Badalamenti E.[1], Laschi A.[1], Orlando S.[1], Catania P.[1], La Mantia T.[1]*

[1] Department of Agricultural, Food and Forest Sciences, University of Palermo, Viale delle Scienze, Ed.4, 90128 Palermo, Italy
[2] D.R.E.AM., Italia, Pratovecchio, Arezzo, Italy

*Corresponding author: giovanna.sala@unipa.it

Cork oak (*Quercus suber* L.) stands, while occupying about 6% (17,261 ha, IFNC 2015) of Sicily's forest area, are of considerable ecological, economic and social importance, including biodiversity conservation and sustainable forest production. They are historically managed as silvo-pastoral systems whose sustainability depends on balanced relationships among their components. In recent years, land use changes, rapid climate change and anthropogenic pressures on these systems have progressively led to their decline and loss of their functions.
In order to understand the structure of cork stands, an integrated multilevel monitoring procedure was implemented in a sample area in Sicily (Ficuzza wood), considering the following components: (i) use of multispectral information from Unmanned Aerial Vehicle (UAV) using a Phantom4 Multispectral to analyze canopy cover (ii) Light Detection and Ranging (LiDAR) technology with Terrestrial Laser Scanning (TLS) tree level surveys; (iii) field data collection.
The use of multi- and hyperspectral information of the area is closely related to the health status of each tree. This information can be obtained through the use of Vegetation Index (VI) and major vegetative characteristics that are closely related to productivity.
TLS is a suitable tool for assessing forest structure with non-destructive, rapid and more accurate measurements; this system allows the acquisition of very high volumes of data and high-resolution point clouds that can be potentially and productively used to derive structural information about forests. We evaluated the main forest parameters, including diameter at the breast height (DBH), height, volume, basal area and stand density.
The results of this study suggested that integration between different monitoring techniques could be a promising tool to describe and monitor canopy structure and productivity of cork oak stands and other forest formations. The current availability of sensors offers the opportunity for more in-depth analyses that could allow advanced and more precise estimates of forest attributes.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Sistema di monitoraggio multilivello per popolamenti di sughera (*Quercus suber* L.) in Sicilia

Sala G.[1], Sofia S.[1], Cassata S.[1], Santosuosso A.[2], La Mela Veca D.S.[1], Badalamenti E.[1], Laschi A.[1], Orlando S.[1], Catania P.[1], La Mantia T.[1]*

[1] Department of Agricultural, Food and Forest Sciences, University of Palermo, Viale delle Scienze, Ed.4, 90128 Palermo, Italy
[2] D.R.E.AM., Italia, Pratovecchio, Arezzo, Italy

*Corresponding author: giovanna.sala@unipa.it

I popolamenti di sughera (*Quercus suber* L.), pur occupando circa il 6% (17.261 ha, IFNC 2015) della superficie forestale siciliana, rivestono una notevole importanza ecologica, economica e sociale, tra cui la conservazione della biodiversità e la produzione forestale sostenibile. Sono storicamente gestiti come sistemi silvo-pastorali la cui sostenibilità dipende da relazioni equilibrate tra le loro componenti. Negli ultimi anni, i cambiamenti di uso del suolo, i rapidi cambiamenti climatici e le pressioni antropiche su questi sistemi hanno progressivamente portato al loro declino e alla perdita delle loro funzioni.
Al fine di comprendere la struttura dei popolamenti sughericoli, in un'area campione della Sicilia (bosco di Ficuzza) è stata implementata una procedura integrata di monitoraggio multilivello, che ha considerato le seguenti componenti: (i) utilizzo di informazioni multispettrali da Unmanned Aerial Vehicle (UAV) con un Phantom4 Multispectral per analizzare la copertura delle chiome (ii) tecnologia Light Detection and Ranging (LiDAR) con rilievi Terrestrial Laser Scanning (TLS) a livello degli alberi; (iii) raccolta dati sul campo.
L'uso di informazioni multi e iperspettrali dell'area è strettamente legato allo stato di salute di ciascun albero. Queste informazioni possono essere ottenute attraverso l'uso degli Indici di Vegetazione (VI) e delle principali caratteristiche vegetative che sono strettamente correlate alla produttività.
Il TLS è uno strumento adatto a valutare la struttura forestale con misure non distruttive, rapide e più accurate; questo sistema permette di acquisire volumi molto elevati di dati e nuvole di punti ad alta risoluzione che possono essere potenzialmente e produttivamente utilizzate per ricavare informazioni strutturali sulle foreste. Abbiamo valutato i principali parametri forestali, tra cui il diametro a petto d'uomo (DBH), l'altezza, il volume, l'area basale e la densità del popolamento.
I risultati di questo studio suggeriscono che l'integrazione tra diverse tecniche di monitoraggio potrebbe essere uno strumento promettente per descrivere e monitorare la struttura delle chiome e la produttività dei popolamenti di querce da sughero e di altre formazioni forestali. L'attuale disponibilità di sensori offre l'opportunità di analisi più approfondite che potrebbero consentire stime avanzate e più precise degli attributi forestali.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

The ectomycorrhizal communities associated with cork oak (*Quercus suber L.*) in various stations of North-East Algeria

Adouane M.[1, 2]*, *Beddiar A.*[1], *Hadjoudja N.*[3], *Ksentini H.*[1], *Abdellaoui K.*[2, 4]

[1] Plant biology and environment laboratory (LBVE), Faculty of Natural and Life Sciences. Badji Mokhtar University, Annaba, Algeria.
[2] Higher National School of Forests, Khenchela, Algeria.
[3]20 August 1955 University, Biology Department, Skikda, Algeria.
[4]Laboratory of Structures, Properties and InterAtomic Interactions (LASPI2A), Faculty of Sciences and Technologies. Abbes Laghrour University, Khenchela 40000, Algeria.

*Corresponding author: adoumer@live.fr

The cork forests of North-East Algeria are in a state of accentuated decline, their natural regeneration is difficult following a series of constraints. It is therefore necessary to intervene for their enhancement by reforestation based on cork oak plants of appreciable quality and good recovery on the ground.
In the Mediterranean region, the transplanting crisis of young plants can be mitigated by controlled mycorrhization which is proved to be a promising tool to improve the performance of the root systems and thus offers to the seedlings a better mineral and hydric nutrition and a resistance to the extreme conditions of the transplanting environment.
For this purpose, particular attention was paid to the mycorrhization of seedlings in nurseries. Moreover, the use of mycorrhization in nurseries requires targeting the most efficient and competitive mycorrhizogenic species and strains adapted to the physical and chemical conditions of the soil.
Within this context, the present study aims to explore the ectomycorrhizal community associated with cork oak seedlings at the nursery stage and to evaluate its structure and functional composition in order to better exploit this symbiosis in the rehabilitation of cork oak forests.
To meet this objective, the trial was oriented, on the one hand, towards the trapping of ectomycorrhizal fungal communities associated with cork oak seedlings cultivated in WM containers for 15 months on forest humus from four different cork forests in northeastern Algeria, and on the other hand, towards estimating the effect of the structure of these communities on the growth of the seedlings, which was evaluated by measuring the growth parameters of the latter. The ectomycorrhizal community was characterized morpho anatomically.
The results obtained, allow us to deduce that cork oak grown for 15 months on different forest soils associates symbiotically with 16 different ectomycorrhizal fungi belonging to several families and characterized by different soil exploration modes. The short and medium distance exploration modes are the most represented. By combining these modes of exploration, the cork oak at the nursery stage ensures a balance between the costs in carbon and the intakes in mineral elements. Cork oak seedlings show variable species richness, taxonomic composition and colonization rate depending on soil provenance. This is due to the junction of multiple biotic and abiotic factors. However, if the degree of colonization allows the stimulation of the growth of seedlings, notably roots, the specific richness per plant does not seem to induce the same effect.
The structure of ECM fungal community is not yet complete. Additional long-term and field research is needed to gain a better understanding of the factors governing ECM fungal communities and their dynamics and to assess their impact on the conservation and sustainability of the cork oak forest.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Les communautés ectomycorhiziennes associées au chêne liège (*Quercus suber* L.) dans différentes stations du Nord-Est algérien

Adouane M.[1, 2]*, *Beddiar A.*[1], *Hadjoudja N.*[3], *Ksentini H.*[1], *Abdellaoui K.*[2, 4]

[1] Plant biology and environment laboratory (LBVE), Faculty of Natural and Life Sciences. Badji Mokhtar University, Annaba, Algeria.
[2] Higher National School of Forests, Khenchela, Algeria.
[3]20 August 1955 University, Biology Department, Skikda, Algeria.
[4]Laboratory of Structures, Properties and InterAtomic Interactions (LASPI2A), Faculty of Sciences and Technologies. Abbes Laghrour University, Khenchela 40000, Algeria.

*Corresponding author: adoumer@live.fr

Les subéraies du Nord-est algérien sont dans un état de dépérissement accentué, leur régénération naturelle est difficile suite à une série de contraintes. Il est donc nécessaire d'intervenir pour leur mise en valeur par des reboisements à base de plants de chêne liège de qualité appréciable et de bonne reprise sur le terrain.
En région méditerranéenne, la crise de transplantation des jeunes plants peut être atténuée par la mycorhization contrôlée qui s'avère un outil prometteur pouvant améliorer la performance des systèmes racinaires et offre ainsi aux plants une meilleure nutrition minérale et hydrique et une résistance aux conditions extrêmes du milieu de transplantation.
A cet effet, une attention particulière a été accordée à la mycorhization des plants en pépinières. Par ailleurs, l'utilisation de la mycorhization en pépinière nécessite de cibler les espèces et les souches mycorhizogènes les plus efficientes, compétitives et adaptées aux conditions physiques et chimiques du sol.
Dans ce contexte, la présente étude vise l'exploration de la communauté ectomycorhizienne associée aux plants de chêne liège au stade pépinière et l'évaluation de sa structure et sa composition fonctionnelle pour mieux exploiter cette symbiose dans la réhabilitation des subéraies. Pour répondre à cet objectif, l'essai a été orienté, d'une part, vers le piégeage des communautés fongiques ectomycorhiziennes associées aux plants de chêne liège élevés en conteneurs WM pendant 15 mois sur de l'humus forestier provenant de quatre subéraies différentes du Nord-est algérien, et d'autre part, vers l'estimation de l'effet de la structure de ces communautés sur la croissance des plants qui a été évaluée par la mesure des paramètres de croissance de ces derniers. La communauté ectomycorhizienne a été caractérisée morpho-anatomiquement.
Les résultats obtenus, permettent de déduire que le chêne liège élevé durant 15 mois sur différents sols forestiers s'associe symbiotiquement à 16 champignons ectomycorhiziens différents appartenant à plusieurs familles et caractérisés par différents modes d'exploration du sol. Les modes d'exploration à courte et à moyenne distance étant les plus représentés. En associant ces modes d'exploration, le chêne liège au stade pépinière, assure l'équilibre entre les coûts en carbone et les apports en éléments minéraux. Les plants de chêne liège montrent une richesse spécifique, une composition taxonomique et un taux de colonisation variables en fonction des provenances des sols. Ceci est dû à la jonction de facteurs multiples d'ordre biotique et abiotique. Toutefois, si le degré de colonisation permet la stimulation de la croissance des semis notamment des racines, la richesse spécifique par plant ne semble pas induire le même effet.
La structure de la communauté fongique ECM n'est pas encore exhaustive. Des recherches supplémentaires à long terme et sur le terrain sont nécessaires pour amples connaissances sur les facteurs qui régissent les communautés fongiques ECM et leur dynamique et pour évaluer leur impact sur la conservation et la durabilité de la subéraie.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Conservation of the natural populations of *Zelkova sicula* Di Pasquale et al. occurring in the SACs "Cozzo Ogliastri" and "Bosco Pisano"

Perrotta G., Colombo A., Marsili S., Currò S.*

Assessorato Regionale dell'Agricoltura, dello Sviluppo e della Pesca Mediterranea - Dipartimento Regionale dello Sviluppo Rurale e Territoriale - Servizio 16 - Servizio per il Territorio di Siracusa

*Corresponding author: silvia.marsili@regione.sicilia.it

The Mediterranean basin is one of the most important areas in the worldwide for biodiversity; insular environments, in particular, are more fragile and sensitive to the impact of human activities and of climate changes, the main survival threats for many species. Therefore, it's crucial to develop conservation strategies for the defense of Mediterranean biomes. In Sicily, *Zelkova sicula* represents an example of a very rare plant of tertiary flora, at serious risk of extinction; its survival is threatened by various factors: the extremely reduced dimensions of the known populations, the loss of genetic variability, the reproduction problems, the difficult adaptation to the current habitat, the heavy anthropic activity. At present there are only two populations known in two Sites of Community Importance, ITA090022 - Bosco Pisano and ITA090024 - Cozzo Ogliastri, located in small areas within the Regional Forestry administrative territory in Sicily. In line with the project LIFE 10 NAT/IT/000237 Zelkov@zione, Dipartimento Regionale dello Sviluppo Rurale e Territoriale Regione Siciliana has carried out the project "*Study, implementation and conservation of the population of Zelkova sicula*" within the PSR Sicilia 2014-2020, Measure 15 - Submeasure 15.2., in collaboration with Istituto di Bioscienze e BioRisorse of CNR - Palermo, with Dipartimento di Ingegneria and Dipartimento di Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche of Palermo University. The project entails actions aimed at protecting the *Z. sicula*: specific actions for the conservation of genetic resources and accompanying actions, information and dissemination of the results achieved.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Studio, implementazione e conservazione delle popolazioni naturali di *Zelkova sicula* presenti nel demanio forestale regionale nei SIC Bosco Pisano (ITA090022) e Cozzo Ogliastri (ITA090024)

Perrotta G., Colombo A., Marsili S., Currò S.*

Assessorato Regionale dell'Agricoltura, dello Sviluppo e della Pesca Mediterranea - Dipartimento Regionale dello Sviluppo Rurale e Territoriale - Servizio 16 - Servizio per il Territorio di Siracusa

*Corresponding author: silvia.marsili@regione.sicilia.it

Il bacino del Mediterraneo è una delle aree più importanti al mondo per la presenza di numerose specie endemiche di notevole importanza ai fini della conservazione della biodiversità con particolare riguardo alla presenza di numerosi ambienti insulari, più fragili e sensibili all'impatto delle attività umane ed ai cambiamenti climatici, fattori che rappresentano la principale minaccia di sopravvivenza per molte specie. La messa a punto di strategie di conservazione è di fondamentale importanza per la difesa dei biomi del Mediterraneo. All'interno di tali iniziative si colloca la *Zelkova sicula*, endemica della Sicilia e rarissima specie relitta della flora terziaria, a grave rischio di estinzione. La sua sopravvivenza è minacciata da vari fattori fra cui: le dimensioni estremamente ridotte delle popolazioni conosciute, la perdita di variabilità genetica, i problemi di riproduzione, il difficile adattamento all'habitat attuale, i pesanti disturbi antropici. Allo stato attuale sono solo due le popolazioni conosciute, ricadenti entrambe all'interno di due Siti di Importanza Comunitaria denominati ITA090022 Bosco Pisano e ITA 090024 Cozzo Ogliastri, in aree ricadenti all'interno del demanio forestale della Regione Siciliana. In linea con il Progetto LIFE 10 NAT/IT/000237, che ha consentito il miglioramento del suo stato di conservazione, il Dipartimento Regionale dello Sviluppo Rurale e Territoriale della Regione Siciliana, in collaborazione con l'Istituito di Bioscienze e BioRisorse del Consiglio Nazionale delle Ricerche di Palermo e con il Dipartimento di Ingegneria ed il Dipartimento di Scienze e Tecnologie Biologiche Chimiche e Farmaceutiche dell'Università degli Studi di Palermo, ha avviato il progetto "*Studio, implementazione e conservazione della popolazione di Zelkova sicula*", nell'ambito del PSR Sicilia 2014-2020, Misura 15 - Sottomisura 15.2. Obiettivo del progetto è quello di attivare una serie di azioni, in continuità coi risultati realizzati negli anni precedenti, volti alla salvaguardia di *Z. sicula* attraverso: azioni specifiche di conservazione delle risorse genetiche ed azioni di accompagnamento, informazione e diffusione dei risultati raggiunti.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Zimbral for life: preserving coastal dunes with *Juniperus* spp.

Baião C.[1,2], Ferreira L.[1,2], Meireles C.[1,2], Pinto-Gomes C.[1,2,3]*

[1] Departamento de Paisagem, Ambiente e Ordenamento, Escola de Ciências e Tecnologia, Universidade de Évora. Rua Romão Ramalho, nº 59. 7000-671 Évora, Portugal.
[2] Instituto Mediterrâneo para a Agricultura, Ambiente e Desenvolvimento, Polo da Mitra, University of Évora, 7000-671 Évora, Portugal.
[3] Instituto de Ciências da Terra (ICT), Escola de Ciências e Tecnologia, Universidade de Évora. Rua Romão Ramalho, nº 59. 7000-671 Évora, Portugal.

*Corresponding author: cmb@uevora.pt

Coastal dunes with Juniperus spp. are an extremely vulnerable habitat, occupying a limited ecological space that is very attractive to some economic sectors, especially tourism, forestry and agriculture. Coastal dunes with Juniperus navicularis are particularly important for conservation purposes, since they are only found in the south-west Iberian Peninsula, with more than 95% of the distribution area located in Portuguese territory. Despite their importance and protection status, dune junipers are classed as having unfavourable-inadequate conservation status in Portugal – and in the Mediterranean as a whole – with a decreasing trend (2250* in Habitat Directive 92/43/CEE). Therefore, Zimbral for LIFE was created to improve its conservation status in Portugal. The project will address the main factors that are preventing the improvement of the habitat's ecological condition. These includes reverse the current trend of habitat degradation and improve its quality in terms of structure and function; increase the habitat's area of occurrence; reduce the habitat's main threats by increasing its resilience to invasive alien species, fire and climate change; test and evaluate habitat management practices; fill in knowledge gaps that constrain habitat restoration on a large scale: either by typical species, distribution or conservation status, creation/testing of monitoring protocols; increase the capacity to act at the territory's management entities; improve societal motivation and cooperation to preserve and monitor the habitat; ensure knowledge dissemination and transfer; replicate project interventions; and foster upscaling and sustainability through dissemination work and development of an national action plan. Zimbral for LIFE has two different scales of action: local and national. Demonstration activities will take place at local level at 6 sites spread across 3 Special Areas of Conservation (SACs) – Comporta, Costa Sudoeste and Ria Formosa/Castro Marim. At national level, covering all SACs in mainland Portugal where the habitat is found, the project aims at knowledge improvement as well as communication and dissemination work in order to develop a better national action plan. The expected results are the recovery of at least 200 ha of coastal dunes with Juniperus spp.; improvement of 100 ha of habitat structure and function; 90 000 native plants produced and planted; 400 individuals of Juniperus spp. grown and planted; creation of 350 ha of buffer areas; detailed cartography produced, management methodologies tested and protocols for plant production published; 8 000 participants in dissemination activities; creation of 5 direct jobs and involvement of 30 landowners; and at last but not the least development of a national conservation plan of this priority habitat.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Zimbral for life: a preservar os Zimbrais dunares

Baião C.[1,2], Ferreira L.[1,2], Meireles C.[1,2], Pinto-Gomes C.[1,2,3]*

[1] Departamento de Paisagem, Ambiente e Ordenamento, Escola de Ciências e Tecnologia, Universidade de Évora. Rua Romão Ramalho, nº 59. 7000-671 Évora, Portugal.
[2] Instituto Mediterrâneo para a Agricultura, Ambiente e Desenvolvimento, Polo da Mitra, University of Évora, 7000-671 Évora, Portugal.
[3] Instituto de Ciências da Terra (ICT), Escola de Ciências e Tecnologia, Universidade de Évora. Rua Romão Ramalho, nº 59. 7000-671 Évora, Portugal.

*Corresponding author: cmb@uevora.pt

As dunas costeiras com a presença de Juniperus spp. são um habitat extremamente vulnerável, ocupando um espaço ecológico limitado e muito atrativo para alguns setores económicos, especialmente para o turismo, a silvicultura e a agricultura. Os zimbrais dunares constituídos por Juniperus navicularis são particularmente importantes para a conservação, uma vez que apenas ocorrem no sudoeste da Península Ibérica, com mais de 95% da área de distribuição localizada em território português. Apesar da sua importância e estatuto de proteção, os zimbrais dunares encontram-se classificados com um estado de conservação desfavorável-inadequado em Portugal – e no Mediterrâneo como um todo – com tendência decrescente (2250* na Diretiva Habitat 92/43/CEE). Por estes motivos, o projeto Zimbral for LIFE pretende inverter a tendência de degradação e melhorar o estado de conservação deste habitat prioritário em Portugal Continental. O projeto abordará os principais fatores que estão a impedir a melhoria da condição ecológica. Entre eles, inverter a atual tendência de degradação e melhorar a sua qualidade em termos de estrutura e função; aumentar a área de ocorrência; reduzir as principais ameaças, aumentando a resiliência a espécies exóticas invasoras, incêndios e alterações climáticas; testar e avaliar as práticas de gestão; preencher lacunas no conhecimento que restringem o restauro do habitat em grande escala: quer sobre espécies típicas, distribuição e estado de conservação, assim como protocolos de monitoramento testados; aumentar a capacidade de atuação das entidades gestoras do território; melhorar a motivação social e a cooperação para preservar e monitorar o habitat; assegurar a disseminação e transferência de conhecimento; replicar as intervenções do projeto; promover o upscaling, a sustentabilidade e desenvolver um plano de ação nacional para o habitat. O Zimbral for LIFE tem duas escalas de atuação distintas: local e nacional. As atividades de demonstração decorrerão a nível local estando distribuídas por 6 locais em 3 Zonas Especiais de Conservação (ZECs) – Comporta, Costa Sudoeste e Ria Formosa/Castro Marim. A nível nacional, abrange todas as ZECs onde o habitat está inserido para melhorar o conhecimento, desenvolver trabalho de disseminação e divulgação, de forma a melhor adequar o plano de ação nacional. Os resultados previstos são: a recuperação de pelo menos 200ha de dunas costeiras com Juniperus spp.; melhoria de 100ha de estrutura e função do habitat; 90 mil plantas nativas produzidas e plantadas; 400 indivíduos de Juniperus spp. multiplicados e plantados; criação de 350ha de zona-tampão; produção de uma cartografia detalhada, metodologias de gestão testadas e protocolos de produção vegetal publicados; 8 000 participantes em atividades de divulgação; criação de 5 empregos diretos e envolvimento de 30 proprietários rurais sendo a última e mais importante, a elaboração de um plano nacional de conservação para este habitat prioritário.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

SiMaSeed PLUS: conservation actions for the endangered *Anthemis aeolica* on small islets of the Aeolian archipelago

Blandino C.[1], Emma G.[1], Di Stefano M.[1], Di Paola A.I.[1], Frazzetto P.[1], Alongi G.[1], Puglia G.D.[2], Lo Cascio P.[3], Cristaudo A.[1]*

[1] Department of Biological, Geological, and Environmental Sciences, University of Catania, Catania, Italy
[2] Consiglio Nazionale delle Ricerche, Istituto per i Sistemi Agricoli e Forestali del Mediterraneo (CNR-ISAFOM) U.O.S. Catania, Italy
[3] Nesos Association, Lipari, Messina, Italy

*Corresponding author: cristina.blandino@unict.it

Among the objectives of SiMaSeed PLUS (Interreg V-A Italia-Malta), there are the *ex situ* and *in situ* conservation of *Anthemis aeolica* Lojac., a narrow endemic species which only known population occurs on the islet of Lisca Bianca (Panarea, *Aeolian Islands, Sicily*). According to Orsenigo et al., (2018), this species must be considered Critically Endangered (CR). *A. aeolica* was described by Lojacono Pojero (1903) for Bottaro, Basiluzzo and Dattilo islets, from where it is actually extinct. Despite of their small size, these islets have been exploited as seasonal pastures. This could have brought *A. aeolica* to extinction both for grazing and soil eutrophication, which favoured the establishment of more competitive, halo-nitrophilous, species. SiMaSeed PLUS aims to reinforce the population of *A. aeolica* in Lisca Bianca and to reintroduce it in Bottaro and Basiluzzo. Suitable sites for its reintroduction have been identified with the analysis of orthophotos and defined with *in situ* surveys. On Lisca Bianca three areas occupied by *Opuntia ficus-indica* and one area occupied by *Carpobrotus spp*., both invasive alien species, were identified and mapped by drone in June 2022. Their eradication is being implemented. We are manually removing all *Carpobrotus*: the uprooted material is sealed in black plastic bags, and accumulated in a temporary storage area. The high temperatures reached inside the bags will favour the loss of vitality of the plant material and the reduction of biomass. Manual eradication is also being carried out for *O. ficus-indica*. In this case, the cladodes are minced *in situ* to produce a hydrogel which, having great water retention capacity, is used as a soil conditioner to improve the survival of the translocated plants. Protocols for the germination and propagation of *A. aeolica* have been developed. *A. aeolica* produces dimorphic cypselae which differ in their germination behaviour. Fresh matured, light cypselae, characterized by a thin pericarp, reach >90% final germination within a wide range of constant temperatures (5-25°C), in presence of light. After three months of dry after ripening, the range of temperatures at which the species reach high germination widens to 30°C. Conversely, dark cypselae, characterized by a thick pericarp, did not germinated at any of the conditions tested and may be included in the soil seed bank. The production of plantlets was more efficient using cypselae younger than two years. These were sown directly on soil and incubated, at 20/10°C, in a growing chamber. The plants were moved to open air after two months, to acclimatize before transferring to the intervention sites. By adopting this protocol, more than 1000 plants have been produced. A protocol for the *in situ* reintroduction and reinforcement is being developed by testing both direct sowing and transplanting. A randomized block experimental design was set up to test the effect of *O. ficus-indica* hydrogel and to assess the residual allelopathic effect of *Carpobrotus* on plant establishment.
Moreover, we will investigate the genetic variability of *A. aeolica* remnant population using microsatellite markers (SSRs), which are commonly employed in population genetics due to their high level of polymorphism.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

SiMaSeed PLUS: azioni per la conservazione di *Anthemis aeolica*, specie minacciata, su piccole isole dell'arcipelago delle Eolie

Blandino C.[1], Emma G.[1], Di Stefano M.[1], Di Paola A.I.[1], Frazzetto P.[1], Alongi G.[1], Puglia G.D.[2], Lo Cascio P.[3], Cristaudo A.[1]*

[1] Department of Biological, Geological, and Environmental Sciences, University of Catania, Catania, Italy
[2] Consiglio Nazionale delle Ricerche, Istituto per i Sistemi Agricoli e Forestali del Mediterraneo (CNR-ISAFOM) U.O.S. Catania, Italy
[3] Nesos Association, Lipari, Messina, Italy

*Corresponding author: cristina.blandino@unict.it

Tra gli obiettivi del progetto SiMaSeed PLUS (Interreg V-A Italia-Malta), figura la conservazione *in situ* ed *ex situ* di *Anthemis aeolica* Lojac., una specie endemica estremamente localizzata, la cui unica popolazione conosciuta si trova sull'isolotto di Lisca Bianca (Panarea, Isole Eolie). Secondo Orsenigo et al., (2018), questa specie è da considerarsi in Pericolo Critico (CR). *A. aeolica* è stata descritta da Lojacono Pojero (1903) per gli isolotti di Bottaro, Basiluzzo e Dattilo, dai quali risulta attualmente estinta. Nonostante le piccole dimensioni, questi isolotti sono stati sfruttati come pascoli stagionali. Ciò può avere portato alla scomparsa di *A. aeolica* sia per l'eccessiva brucatura sia per l'eutrofizzazione dei suoli che hanno favorito l'affermarsi di specie alo-nitrofile più competitive. SiMaSeed PLUS mira a rafforzare la popolazione *di A. aeolica* presente a Lisca Bianca e a reintrodurla su Bottaro e Basiluzzo. I siti idonei alla reintroduzione sono stati individuati con l'analisi di foto aeree e confermati tramite sopralluoghi sul campo. Su Lisca Bianca sono state identificate e mappate, tramite drone, tre aree occupate da *Opuntia ficus-indica* e un'area occupata da *Carpobrotus spp.*, entrambe specie aliene invasive, alla cui eradicazione si sta procedendo. La rimozione di *Carpobrotus* è effettuata manualmente ed il materiale raccolto viene immagazzinato in sacchi di plastica neri sigillati, i quali sono successivamente esposti al sole. Le elevate temperature che si raggiungono all'interno dei sacchi causano la perdita di vitalità del materiale rimosso e la riduzione della sua biomassa. Anche nel caso di *Opuntia ficus-indica* si sta procedendo alla rimozione manuale. I cladodi sono macinati *in situ* per produrre un idrogel che, dotato di elevata capacità nel trattenere l'acqua, viene utilizzato come ammendante del suolo per favorire la sopravvivenza delle plantule traslocate. Sono stati definiti i protocolli di germinazione e di propagazione di *A. aeolica*. Questa specie produce cipsele dimorfiche che differiscono nel comportamento germinativo. Le cipsele di colore chiaro sono caratterizzate da un pericarpo sottile e superano il 90% di germinazione, in presenza di luce, a temperature comprese tra i 5 ed i 25°C; dopo tre mesi di post maturazione riescono a raggiungere alte percentuali di germinazione anche a 30°C. Al contrario, le cipsele scure, caratterizzate da un pericarpo spesso, non germinano a nessuna delle condizioni testate e potrebbero venire incluse nella banca dei semi del suolo. La produzione di plantule è risultata più efficiente utilizzando cipsele non più vecchie di due anni, che sono state seminate direttamente su suolo, in contenitori alveolati, ed incubate in camera di crescita alla temperatura di 20/10°C. Dopo due mesi, le piante prodotte sono state spostate all'aperto per l'acclimatazione, in previsione del trasferimento nei siti di intervento. In questo modo sono state prodotte più di 1000 piante. Un protocollo per le azioni di rafforzamento e reintroduzione è in corso di sperimentazione e prevederà l'utilizzo sia di semi che di plantule. Un disegno sperimentale a blocchi randomizzati è stato predisposto a Lisca Bianca per testare l'efficacia dell'idrogel di *Opuntia ficus-indica* e per valutare il potenziale effetto allelopatico degli essudati radicali del *Carpobrotus,* nelle aree in cui è stato appena rimosso. Inoltre, verrà studiata la variabilità genetica dell'unica popolazione rimasta di *Anthemis aeolica* utilizzando marcatori microsatellite (SSRs), comunemente utilizzati in genetica delle popolazioni per il loro alto livello di polimorfismo.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Germination, propagation and conservation of endemic and endangered species of the Mediterranean flora

Crisafulli A., Rando C., Gargiulo G., Picone R.M.*

Department of ChiBioFarAm and Botanical Garden "Pietro Castelli", University of Messina

*Corresponding author: crisafullia@unime.it

In the last 20 years, the "Pietro Castelli" Botanical Garden of the University of Messina has dealt with problems concerning the conservation of endemic and endangered Mediterranean species, especially those present in the Straits of Messina area (Picone et al., 2002; Crisafulli et al., 2013). In situ monitoring, assessment and evaluation of their risk status have been achieved according to the IUCN categories (Spampinato et al., 2008; Crisafulli & Picone, 2010; Spampinato et al., 2011; Picone et al., 2013). Moreover, ex situ reproduction of various of these taxa, comprehensive of Angiosperms, Gymnosperms and some rare Pteridophytes, has been carried out. This experimentation has involved over 50 species, for some of which we have developed protocols that have produced, in subsequent years, many plants that flower and bear fruit regularly. For other species, we are in an initial phase with positive data on germination and production of young seedlings. The importance of protecting and safeguarding the biodiversity of one's territory is accompanied by the dissemination activity of the Botanical Garden about the conservation of endangered flora, cultivating species of more excellent ornamental value in public and private places and thus contributing to their conservation ex situ.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Germinazione e propagazione di specie endemiche e a rischio d'estinzione della flora mediterranea

Crisafulli A., Rando C., Gargiulo G., Picone R.M.*

Department of ChiBioFarAm and Botanical Garden "Pietro Castelli", University of Messina

*Corresponding author: crisafullia@unime.it

Nell'ultimo ventennio l'Orto Botanico "Pietro Castelli" dell'Università di Messina si è occupato di problematiche inerenti il tema della conservazione di specie endemiche e a rischio d'estinzione mediterranee con particolare attenzione a quelle presenti nell'area dello Stretto di Messina (Picone *et al.*, 2002; Crisafulli *et al.*, 2013). Oltre ad attività di monitoraggio *in situ*, assessment e valutazione del grado di rischio secondo le categorie IUCN (Spampinato *et al.,* 2008; Crisafulli & Picone, 2010; Spampinato et al., 2011; Picone *et al.*, 2013) si sono avviate sperimentazioni per la riproduzione *ex situ* di diverse specie di Angiosperme e Gimnosperme nonché di alcune rare Pteridofite. Tale sperimentazione ha interessato oltre 50 specie, per alcune delle quali sono stati messi a punto protocolli che hanno consentito di produrre in anni successivi un elevato numero di piante che fioriscono e fruttificano regolarmente. Per altre si è in una fase iniziale con dati positivi di germinazione e affrancamento delle giovani plantule. All'importanza di tutelare e salvaguardare la biodiversità del proprio territorio, si affianca l'attività di divulgazione dell'Orto Botanico in relazione alla conservazione della flora a rischio di estinzione, inserendo in spazi pubblici e privati le specie di maggior valenza ornamentale e contribuendo così alla loro conservazione *ex situ*.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Local adaptation or phenotypic plasticity? A study on two isolated populations of *Silene hicesiae* Brullo & Signor.

Emma G. [1]*, *Blandino C.* [1], *Di Paola A.I.* [1], *Puglia G.D.* [2], *Frazzetto P.* [1], *Walter G.M.* [3], *Cristaudo A.* [1]

[1] Department of Biological, Geological, and Environmental Sciences, University of Catania, Catania, Italy
[2]Institute for Agricultural and Forestry Systems in the Mediterranean (ISAFoM), Department of Biology, Agriculture and Food Science (DiSBA), National Research Council (CNR), Catania, Italy
[3] School of Biological Sciences, Monash University, Melbourne, 3800, Victoria, Australia

*Corresponding author: giuseppe.emma@phd.unict.it

Due to geographical isolation and environmental stressors, endemic species may suffer severe population declines. However, we still understand very little about how or why populations of endemic species become differentiated or whether they vary in their vulnerability to extinction. *Silene hicesiae* Brullo & Signor. is a rare species, exclusive to the Aeolian Archipelago, with only two known populations on the islands of Panarea and Alicudi that are 60 km apart. *S. hicesiae* is threatened by invasive alien species, trampling and grazing pressure from wild goats, and cliff instability. Few studies have been conducted on the ecology of *S. hicesiae* and little is known about its reproductive success, germination niche and morpho-physiology of adult plants. Our study uses field, glasshouse and laboratory experiments to compare functional and life history traits of the two populations to assess whether geographical isolation and island endemism has caused divergence in their trait expression, and if these differences are due to phenotypic plasticity or local adaptation.
Germination tests have been performed with seeds from both populations by incubating seeds at different temperatures and light regimes. Both radicle emergence and cotyledon opening were scored. The seedlings obtained were transferred to a phytoclimatic chamber at 20/10°C for eight weeks and then to a greenhouse. Three-month old plants were used to measure the content of leaf chlorophyll, anthocyanins and flavonols. To estimate reproductive success in the natural populations, for each inflorescence we will quantify flower production, fruit set and number of seeds per fruit of randomly selected individuals, in both populations. In the field, we will establish permanent plots to investigate plant development by tagging individual plants and measuring them regularly.
Preliminary results show that the average number of seeds per fruit was 78.51 and 97 for the Alicudi and Panarea populations, respectively. Seeds from Panarea exhibited higher germination at cold temperatures (10/0 and 5°C) in comparison to Alicudi, which performed significantly better at the highest temperatures (25 and 25/20°C). Cotyledon opening occurred soon after germination, at an increasing rate as temperatures rise. In the greenhouse, three-month-old plants of the two populations had the same content of chlorophyll, anthocyanins, and flavonols. The first on-site monitoring (2022) revealed that the Panarea population flowers about one month earlier in the year than Alicudi and its altitudinal range is narrower.
The observed differences in germination behavior and in flowering phenology between the two populations are likely due to them experiencing different microclimatic and topographic conditions (elevation, slope gradient, exposure, solar radiation). For example, the average annual temperature, estimated for the period 1980-2010 in Panarea, is 1.5°C higher than in Alicudi, and its annual precipitations are, on average, 59.2 mm/m2 lower.
These microclimatic factors that influence the two populations will be taken into account when analyzing the expression of each functional trait. Our data may be used to elaborate predictive models of the vulnerability/adaptation degree to environmental stresses of the two populations of *S. hicesiae* and be useful for planning its conservation.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Adattamento locale o plasticità fenotipica? Studio su due popolazioni isolate di *Silene hicesiae* Brullo & Signor.

Emma G.[1]*, *Blandino C.*[1], *Di Paola A.I.*[1], *Puglia G.D.*[2], *Frazzetto P.*[1], *Walter G.M.*[3], *Cristaudo A.*[1]

[1] Department of Biological, Geological, and Environmental Sciences, University of Catania, Catania, Italy
[2]Institute for Agricultural and Forestry Systems in the Mediterranean (ISAFoM), Department of Biology, Agriculture and Food Science (DiSBA), National Research Council (CNR), Catania, Italy
[3] School of Biological Sciences, Monash University, Melbourne, 3800, Victoria, Australia

*Corresponding author: giuseppe.emma@phd.unict.it

A causa dell'isolamento geografico e di stress ambientali, le popolazioni di specie endemiche possono subire un drastico declino. Tuttavia, sappiamo ancora molto poco su come le popolazioni di specie endemiche si differenziano o su come varia la loro vulnerabilità all'estinzione. *Silene hicesiae* Brullo & Signor. è una specie rara, esclusiva dell'arcipelago delle Eolie, con due sole popolazioni conosciute per le isole di Panarea e Alicudi, distanti 60 km l'una dall'altra. *S. hicesiae* è minacciata da specie aliene invasive, dal calpestio e dal pascolo di capre selvatiche, e dall'instabilità delle falesie su cui cresce. Pochi studi sono stati condotti sull'ecologia di *S. hicesiae* e poco si conosce relativamente al suo successo riproduttivo, alla nicchia di germinazione e alla morfo-fisiologia delle piante adulte. Il nostro studio ha lo scopo di valutare, attraverso il confronto di tratti funzionali misurati in campo, in common garden e in laboratorio, se l'isolamento geografico e l'endemismo insulare abbiano causato divergenze nell'espressione degli stessi tra le due popolazioni e se queste divergenze siano dovute alla plasticità fenotipica o all'adattamento locale. Sono stati eseguiti test di germinazione con semi di entrambe le popolazioni, incubati a diverse condizioni di temperatura e luce, registrando sia l'emergenza della radichetta sia l'apertura dei cotiledoni. Le plantule ottenute sono state trasferite in una camera fitoclimatica a 20/10°C per otto settimane e quindi in serra. Dopo tre mesi, è stato misurato il contenuto di clorofilla fogliare, di antociani e di flavonoli dalle piante cresciute in serra. Per stimare il successo riproduttivo delle popolazioni naturali, da individui selezionati casualmente si quantificheranno, per ogni infiorescenza, i fiori, i frutti e i semi prodotti per frutto. In campo, si collocheranno dei plot permanenti per studiare lo sviluppo delle piante, marcandole e misurandole regolarmente. I risultati preliminari del nostro studio hanno indicato che il numero medio di semi per frutto varia tra 78,51 e 97 per le popolazioni di Alicudi e Panarea, rispettivamente. I semi di Panarea hanno presentato una percentuale di germinazione più elevata a temperature fredde (10/0 e 5°C) rispetto a quelli di Alicudi che, viceversa, hanno espresso una germinazione significativamente più alta alle temperature più calde (25 e 25/20°C). L'apertura dei cotiledoni è avvenuta subito dopo la germinazione, con una velocità crescente all'aumentare della temperatura. Dopo tre mesi in serra, le piante di entrambe le popolazioni hanno mostrato lo stesso contenuto in clorofilla, antociani e flavonoli. Il primo monitoraggio in loco (2022) ha rivelato che la popolazione di Panarea anticipa la fioritura di circa un mese rispetto ad Alicudi. Inoltre, la popolazione di Panarea e si distribuisce in una fascia altitudinale più ristretta rispetto ad Alicudi. Le differenze fin qui osservate nel comportamento germinativo e nella fenologia della fioritura tra le due popolazioni sono probabilmente dovute riconducibili ad una combinazione di condizioni microclimatiche e topografiche (altitudine, pendenza, esposizione, radiazione solare). Ad esempio, la temperatura media annua stimata per Panarea (1980-2010) è di 1,5°C superiore rispetto ad Alicudi, e le precipitazioni medie annue sono più basse di 59,2 mm/m2. Inoltre, la popolazione di Panarea si distribuisce in una fascia altitudinale più ristretta rispetto ad Alicudi. Questi fattori microclimatici che influenzano le due popolazioni saranno tenuti in conto nella valutazione dell'espressione di ciascun tratto funzionale. I dati che si otterranno saranno utilizzati per costruire dei modelli predittivi del grado di vulnerabilità/adattamento delle due popolazioni di *S. hicesiae* agli stress ambientali e saranno utili alla pianificazione di misure idonee per la conservazione della specie.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Conservation action plan for *Ptilostemon greuteri* (Asteraceae), an enigmatic climate relict from Sicily (Italy)

Gristina A.S.[1,2], Marcenò C.[3], Guarino R.[4], Pasta S.[1], Scuderi L.[5], Perraudin V.[6], Fazan L.[6], Kozlowski G.[6,7,8], Garfì G.[1]*

[1] Institute of Biosciences and BioResources – National Research Council, Unit of Palermo, Corso Calatafimi 414, 90129 Palermo, Italy
[2] Department DISTEM, University of Palermo, Via Archirafi 22, I-90123, Palermo, Italy
[3] Department of Chemistry, Biology and Biotechnology, University of Perugia, Italy
[4] Department STEBICEF, Botanical Unit, University of Palermo, Via Archirafi 38, I-90123, Palermo, Italy
[5] Via Andromaca 60, I-91100, Trapani, Italy
[6] Botanic Garden and Department of Biology, University of Fribourg, Chemin du Musée 10, 1700 Fribourg, Switzerland
[7] Natural History Museum Fribourg, Chemin du Musée 6, 1700 Fribourg, Switzerland
[8] Eastern China Conservation Centre for Wild Endangered Plant Resources, Shanghai Chenshan Botanical Garden, 3888 Chenhua Road, Songjiang, 201602 Shanghai, China

*Corresponding author: alessandrosilvestre.gristina@unipa.it

Ptilostemon greuteri is considered among the most endangered and poorly studied woody vascular plants of the Mediterranean Basin. This extremely narrow endemic plant species is only known from two populations located in northwestern Sicily (Italy), namely in the Special Area of Conservation (SAC) ITA010015 "Complesso Monti di Castellammare del Golfo". A research project was set up to fill the knowledge gaps concerning this enigmatic species and to draw a dedicated conservation action plan. A multifaceted approach utilising cross-cutting methodology allowed us to collect on-site valuable data on the biology, distribution, conservation status and ecology of *P. greuteri*. After three years of field monitoring, we present here some project advances and results of both ecological analyses and species distribution modelling. Our findings indicate that local topographic and meso-climatic factors (air humidity and shade) are key variables explaining the persistency and survival of *P. greuteri* in the area and suggest that micro-topographic and micro-climatic features play an even more important role during the key phases of its life cycle, i. e., seed germination, seedling establishment and adult growth. Our results also highlighted that wildfires are the most important disturbance factor and potential threat for *P. greuteri*, due to its inability to resprout after burning and its obligate seeder strategy. Its fire adaptation strategy and its high competitiveness in colonising free suitable habitats, show that the species has a strikingly pioneer behaviour and takes advantage from disturbance factors that hamper local vegetation dynamics. Extreme climatic events, in addition to related damages caused by pathogenic fungi affecting weakened plants, are also among the main threats to the species' survival. Species distribution modelling did not permit to discover any new populations, underlining the rarity and the extremely narrow niche of the species. Our ongoing conservation plan aims at mitigating species extinction risk, and involves regular monitoring of the extant populations, management practices to contrast habitat evolution towards the most mature and dense stages and the establishment of new populations in the few and small surfaces with suitable habitats identified by the species distribution model.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Piano d'azione per la conservazione di *Ptilostemon greuteri* (Asteraceae), un enigmatico relitto climatico della Sicilia (Italia)

Gristina A.S.[1,2], Marcenò C.[3], Guarino R.[4], Pasta S.[1], Scuderi L.[5], Perraudin V.[6], Fazan L.[6], Kozlowski G.[6,7,8], Garfì G.[1]*

[1] Institute of Biosciences and BioResources – National Research Council, Unit of Palermo, Corso Calatafimi 414, 90129 Palermo, Italy
[2] Department DISTEM, University of Palermo, Via Archirafi 22, I-90123, Palermo, Italy
[3] Department of Chemistry, Biology and Biotechnology, University of Perugia, Italy
[4] Department STEBICEF, Botanical Unit, University of Palermo, Via Archirafi 38, I-90123, Palermo, Italy
[5] Via Andromaca 60, I-91100, Trapani, Italy
[6] Botanic Garden and Department of Biology, University of Fribourg, Chemin du Musée 10, 1700 Fribourg, Switzerland
[7] Natural History Museum Fribourg, Chemin du Musée 6, 1700 Fribourg, Switzerland
[8] Eastern China Conservation Centre for Wild Endangered Plant Resources, Shanghai Chenshan Botanical Garden, 3888 Chenhua Road, Songjiang, 201602 Shanghai, China

*Corresponding author: alessandrosilvestre.gristina@unipa.it

Ptilostemon greuteri è considerata tra le piante vascolari legnose più minacciate e meno studiate del bacino del Mediterraneo. Si tratta di un endemismo puntiforme della Sicilia occidentale (Italia), di cui sono note solo due popolazioni distribuite all'interno della Zona Speciale di Conservazione (ZSC) ITA010015 "Complesso Monti di Castellammare del Golfo". Per colmare le lacune conoscitive su questa specie enigmatica e per definire un piano d'azione finalizzato alla sua conservazione, è stato avviato un progetto che, avvalendosi di tecnologie all'avanguardia, ha consentito di raccogliere *in situ* dati utili per definire biologia, distribuzione, stato di conservazione ed esigenze ecologiche di *P. greuteri*. Dopo tre anni di monitoraggio sul campo, si presenta lo stato di avanzamento del progetto e i risultati delle analisi ecologiche e del modello di distribuzione della specie target. I risultati indicano che i fattori topografici e mesoclimatici locali (umidità dell'aria e ombreggiamento) sono variabili chiave per spiegare la persistenza e la sopravvivenza di *P. greuteri* a Monte Inici e suggeriscono che le caratteristiche microtopografiche e microclimatiche giocano un ruolo ancor più importante durante le prime fasi del ciclo di vita di questa specie, i. e., germinazione dei semi, insediamento delle plantule e sviluppo degli adulti. I nostri risultati hanno anche evidenziato che gli incendi boschivi sono il più importante fattore di disturbo e potenziale minaccia per *P. greuteri*, a causa della sua incapacità di riprodursi per via vegetativa dopo l'incendio e della sua strategia riproduttiva dipendente esclusivamente dalla rinnovazione da seme. La sua elevata competitività nel colonizzare habitat liberi idonei, successivamente al passaggio del fuoco, suggerisce che *P. greuteri* sia una specie con un'ecologia pioniera, in grado di trarre vantaggio da fattori di disturbo che promuovono la regressione della successione ecologica, purché non troppo frequenti. Anche gli eventi climatici estremi e i danni causati da funghi patogeni sono da annoverare tra le principali minacce alla sopravvivenza delle specie. Il modello di distribuzione della specie non ha portato alla scoperta di nuove popolazioni ed ha evidenziato la rarità e la ridotta estensione dell'habitat idoneo per la specie lungo la costa nord-occidentale della Sicilia. Il piano di conservazione, in fase di realizzazione, mira a mitigare il rischio di estinzione della specie e include attività di monitoraggio delle popolazioni esistenti, pratiche di gestione che contengano l'evoluzione dell'habitat verso stadi maturi e la creazione di nuove popolazioni nelle poche aree-habitat idonee, identificate attraverso un modello di distribuzione della specie.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Possible effects of climate change on the range of *Prunus lusitanica* based on IPCC scenarios

Raposo M.[1,2,3]*, *Del Río S.*[4], *Vázquez-Pardo F.*[5], *Pinto-Gomes C.*[1,2,3]

[1] Department of Landscape, Environment and Development, School of Science and Technology, University of Évora, Évora (Portugal)
[2] Institute of Earth Sciences (ICT), School of Sciences and Technology & IIFA, University of Évora, 7000-671 Évora (Portugal)
[3] Mediterranean Institute for Agriculture, Environment and Development (MED), University of Évora, Évora (Portugal)
[4] Department of Biodiversity & Environmental Management (Botany), Faculty of Biology & Environmental Sciences, Mountain Livestock Institute (CSIC-ULE), University of Leon, León (Spain)
[5] Departamento de Producción Florestal y Pastos, Centro de Investigación Finca La Orden-Valdesequera (CICYTEX), 06187 Guadajira (Spain)

*Corresponding author: mraposo@uevora.pt

Paleotropical forests suffered a strong reduction in their area of distribution during the Neogene and Quaternary Periods, which resulted in the disappearance of most of the typical Laurisilva flora on the European continent. However, some plants survived and took refuge in areas with mild temperatures and high humidity, becoming rare in the current landscape, as is the case of the Portuguese-laurel (*Prunus lusitanica* L.). Periods of intense cold and the increase in the mediterranean character (increased summer dryness) had negative consequences on the distribution area of the Portuguese-laurel, contributing to aggravating its degree of threat. Currently, the Portuguese-laurel is classified globally with the Endangered category, according to the IUCN criteria. Thus, in order to better understand the influence of climate in these communities, the current bioclimatic amplitude is analyzed based on a set of Bioclimatic Indexes, such as the Continentality Index, Thermicity Index and the Ombrothermic Index. Based on this information, it is projected for the future, taking into account the climate change scenarios created by the IPCC, the expected distribution area of the Portuguese-laurel for the future, with a view to creating possible mitigation measures. Areas of potential reduction are also estimated for each scenario and a set of management measures is suggested with a view to improving the conservation status of the Portuguese-laurel.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Possíveis efeitos das alterações climáticas na área de distribuição de *Prunus lusitanica* com base em cenários do IPCC

Raposo M.[1,2,3]*, *Del Río S.*[4], *Vázquez-Pardo F.*[5], *Pinto-Gomes C.*[1,2,3]

[1] Department of Landscape, Environment and Development, School of Science and Technology, University of Évora, Évora (Portugal)
[2] Institute of Earth Sciences (ICT), School of Sciences and Technology & IIFA, University of Évora, 7000-671 Évora (Portugal)
[3] Mediterranean Institute for Agriculture, Environment and Development (MED), University of Évora, Évora (Portugal)
[4] Department of Biodiversity & Environmental Management (Botany), Faculty of Biology & Environmental Sciences, Mountain Livestock Institute (CSIC-ULE), University of Leon, León (Spain)
[5] Departamento de Producción Florestal y Pastos, Centro de Investigación Finca La Orden-Valdesequera (CICYTEX), 06187 Guadajira (Spain)

*Corresponding author: mraposo@uevora.pt

As florestas paleotropicais sofreram uma forte redução na sua área de distribuição durante os Períodos Neogeno e Quaternário, o que teve como consequência o desaparecimento da maior parte da flora típica da Laurissilva do continente europeu. Porém, algumas plantas sobreviveram e refugiaram-se em áreas com temperaturas amenas e elevada humidade, tornando-se raras na paisagem atual, como é o caso do azereiro (*Prunus lusitanica* L.). Períodos de frio intenso e o aumento do caracter mediterrânico (aumento da secura estival) tiveram consequências negativas na área de distribuição do azereiro, contribuindo para agravar o seu grau de ameaça. Atualmente o azereiro está classificado a nível global com a categoria Endangered, através dos critérios da IUCN. Assim, de forma a melhor compreender a influência do clima nos azereirais, analisa-se a amplitude bioclimática atual com base num conjunto de Índices Bioclimáticos, tais como o Índice de Continentalidade, Índice de Termicidade e o Índice Ombrotérmico. Com base nestas informações, projeta-se para o futuro, tendo em conta os cenários de alterações climáticas criadas pelo IPCC, a área de distribuição espectável do azereiro para o futuro, tendo em vista a criação de possíveis medidas de mitigação. Estimam-se ainda as áreas de redução potencial para cada cenário e sugerem-se um conjunto de medidas de gestão tendo em vista a melhoria do estado de conservação do azereiro.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Genetic tools for chestnut biodiversity management

*Nunziata A.**

CREA - Council for Agricultural Research and Economics, Research Centre for Olive, Fruit and Citrus Crops, Caserta, Italy

*Corresponding author: angelina.nunziata@crea.gov.it

Biodiversity management can be highly enhanced by a rapid detection of the genetic characteristics of resources and by the possibility of monitoring genotypes and populations distribution as well as by having a clear picture on how specific pollens flow in different landscapes.
Despite molecular markers are the tool of choice for genetic characterization, they are poorly used outside academic and research contexts and were never really used for practical day by day management of chestnut reproductive materials as well as for wood management by the different involved stakeholders. The reason for this scarce exploitation of molecular markers potential is mainly linked to the cryptic nature of gained data, that usually need a competent and informed staff for their correct interpretation. In recent years, new molecular tools based on single nucleotide polymorphisms (SNP) were released for chestnut genotype identification that result in easily readable data (Nunziata et al. 2020).
Since then, many endorsements to the method came from the policy makers as well as from many involved stakeholders and several applications of the method were tested. First of all, the stability of the identified markers was tested on the different branches of the Hundred Horses Chestnut, so to verify that targeted SNP were not subject to point mutation during clonal growth (Nunziata et al., 2022). Besides, the method was tested and used for the genetic discrimination of different clones that exhibited resistance or tolerance to the gall wasp in Campania region, allowing to identify a consistent number of different resistant clones (URCOFI, Progetto speciale Castagno). In another application study, genetic distances gained by the use of these molecular markers were successfully used for evaluating the possibility of mapping chestnut genetic resources in the Campanian protected Regional Park of the volcanic area of "Roccamonfina and foce del Garigliano", (Calandrelli et al., 2023). At now, efforts are ongoing for a rapid buildup of a complete reference genotype database within the project Valore Castagno and for the release of these data within a web application for a targeted scale down of the minimal number of data needed for proper genotype identification (KASTRACK project).
In the next future, these markers could be applied for pollen flow monitoring directly by analyzing pollen genetic composition or, indirectly, by analyzing properly selected seedlings as previously done by Alcaide et al (2022).

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Strumenti genetici per la gestione della biodiversità del castagno

*Nunziata A.**

CREA - Council for Agricultural Research and Economics, Research Centre for Olive, Fruit and Citrus Crops, Caserta, Italy

*Corresponding author: angelina.nunziata@crea.gov.it

La gestione della biodiversità può essere fortemente agevolata da un rapido rilevamento delle caratteristiche genetiche delle risorse e dalla possibilità di monitorare la distribuzione di genotipi e popolazioni, nonché avere un quadro chiaro su come i pollini specifici si muovano tra i diversi paesaggi.
Nonostante i marcatori molecolari siano lo strumento d'elezione per la caratterizzazione genetica, sono scarsamente utilizzati al di fuori dei centri accademici e di ricerca e non sono mai stati realmente utilizzati per la gestione pratica quotidiana dei materiali riproduttivi di castagno e per la gestione del legno da parte delle diverse parti interessate. La ragione di questo scarso sfruttamento delle potenzialità dei marcatori molecolari è principalmente legata alla natura criptica dei dati acquisiti, che solitamente necessitano di personale competente e informato per la loro corretta interpretazione. Negli ultimi anni sono stati rilasciati nuovi strumenti molecolari basati su polimorfismi a singolo nucleotide (SNP) per l'identificazione del genotipo del castagno che si traducono in dati facilmente leggibili (Nunziata et al. 2020).
Da allora, il metodo proposto ha ricevuto consensi numerosi da parte dei decisori politici e di molte parti coinvolte e sono state testate diverse applicazioni del metodo. Innanzitutto, la stabilità dei marcatori identificati è stata testata sui diversi rami del Castagno dei Cento Cavalli, in modo da verificare che gli SNP target non fossero soggetti a mutazione puntiforme durante la crescita clonale (Nunziata et al., 2022). Inoltre, il metodo è stato testato e utilizzato per la discriminazione genetica di diversi cloni che hanno mostrato resistenza o tolleranza al cinipide in Campania, consentendo di identificare un numero consistente di cloni resistenti (URCOFI, Progetto speciale Castagno). In un altro studio applicativo, le distanze genetiche acquisite dall'uso di questi marcatori molecolari sono state utilizzate per verificare la possibilità di mappare le risorse genetiche del castagno nell'area vulcanica protetta del Parco regionale campano di "Roccamonfina e foce del Garigliano"; (Calandrelli et al., 2023). Al momento, sono in corso sforzi per una rapida costruzione di un database completo di genotipi di riferimento nell'ambito del progetto Valore Castagno e per il rilascio di questi dati all'interno di un'applicazione web per una riduzione mirata del numero minimo di dati necessari per una corretta identificazione del genotipo (progetto KASTRACK).
Nel prossimo futuro, questi marcatori potrebbero essere applicati per il monitoraggio del flusso di polline direttamente analizzando la composizione genetica del polline o, indirettamente, analizzando piantine opportunamente selezionate come precedentemente fatto da Alcaide et al (2022).

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

UAS monitoring on steep slopes in Alicudi and Panarea (Aeolian Islands) to assess the population size of Silene hicesiae Brullo & Signor. (Caryophyllaceae)

Di Stefano M.[1]*, *Brighenti F.*[2], *Carnemolla F.*[2], *De Guidi G.*[2], *Blandino C.*[1], *Sciandrello S.*[1], *Cristaudo A.*[1]

[1]Department of Biological, Geological and Environmental Sciences, Germplasm Bank (BGS-CT) University of Catania, Via Empedocle 58, 95128 – Catania, Italy
[2]Department of Biological, Geological and Environmental Sciences, GEOdynamic & GEOmatic LAB, University of Catania, Corso Italia 57, 95129 – Catania, Italy

*Corresponding author: mario.distefano@phd.unict.it

Cliffs and rocky slopes harbour a rich and specialized plant diversity, characterized by rare, endemic and threatened species. One of these species is *Silene hicesiae* Brullo & Signor., endemic to the Aeolian archipelago (Sicily), with only two known populations for Alicudi and Panarea islands. This perennial herb is threatened by trampling, grazing, wildfires and, especially in Alicudi Island, by rock instability and cliff collapse.
S. hicesiae is listed in the Annexes II and IV of the 92/43/CEE "Habitat" Directive as priority species and is subject to an annual requirement of monitoring (Troia & Domina, 2016). However, monitoring species and habitats on cliffs and steep slopes can be challenging and dangerous. In order to better assess the two populations' size and easily explore the complex morphology of the rocky cliffs, we performed a survey with UAS (Unmanned Aircraft System).
The aerial imagery was acquired using a Phantom 4 Professional drone. A total of 21 flights were performed on May and June 2022, both in Alicudi and Panarea islands, and more than 4000 photos were taken, covering an area of approximately 0.425 km^2. Dense point clouds, digital surface models (DSMs), orthomosaics and 3D textured mesh were obtained from each flight using the photogrammetry software Agisoft Metashape. The orthophotos and the orthomosaics were visually analyzed to identify and mark the plants of *S. hicesiae,* acquiring the exact positions, altitude, slope and exposure. From these data it was possible to realize the solar irradiance map.
About 400 individuals of *S. hicesiae,* in Panarea and 550 in Alicudi were identified. The analysis of orthophotos highlighted higher percentages of plants living on steep cliffs in Alicudi rather than in Panarea. The dominant exposure was North-West to North-East for both populations, with the one from Alicudi showing a marked peak towards North. *S. hicesiae* inhabits mainly shady and steep cliffs in Alicudi, while in Panarea it grows also on sunny plateau. Indeed, the irradiance analysis revealed a preference for low values of solar irradiance for the Alicudi population (among 200-300 kWh/m^2).
To our knowledge, this is the first study that has used UAS to map *S. hicesiae*. The high number of plants identified in Alicudi proved the efficiency of UAS technology, especially if compared with the visual estimate of 10-30 individuals reported in the literature for the same population. However, the survey of the two populations is still in progress because all their potential area of distribution in the two islands it has not been covered yet.
The surveys carried out in 2022-2023 represent a starting point for detecting changes in the two populations over time, with repeated and cost-efficient monitoring. The current IUCN risk status of the species could be reassessed after the reinforcement and monitoring activities implemented with the LIFE SEEDFORCE project (LIFE20 NAT/IT/001468).

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Monitoraggio tramite UAS per valutare la consistenza delle popolazioni di *Silene hicesiae* Brullo & Signor. (Caryophyllaceae) su pendii scoscesi ad Alicudi e Panarea (isole Eolie)

Di Stefano M.[1]*, *Brighenti F.*[2], *Carnemolla F.*[2], *De Guidi G.*[2], *Blandino C.*[1], *Sciandrello S.*[1], *Cristaudo A.*[1]

[1]Department of Biological, Geological and Environmental Sciences, Germplasm Bank (BGS-CT) University of Catania, Via Empedocle 58, 95128 – Catania, Italy
[2]Department of Biological, Geological and Environmental Sciences, GEOdynamic & GEOmatic LAB, University of Catania, Corso Italia 57, 95129 – Catania, Italy

*Corresponding author: mario.distefano@phd.unict.it

Pareti e pendii rocciosi offrono rifugio ad una flora ricca e specializzata, caratterizzata da specie rare, endemiche e minacciate. Tra queste vi è *Silene hicesiae* Brullo & Signor., endemismo dell'arcipelago delle Eolie (Sicilia), di cui si conoscono due sole popolazioni per le isole di Alicudi e Panarea. Tale specie erbacea perenne è minacciata da calpestio, pascolo, incendi e, specialmente ad Alicudi, dall'instabilità delle pareti rocciose.
S. hicesiae è presente, come specie prioritaria, negli Allegati II e IV della Direttiva Habitat 92/43/CEE ed è obbligatorio effettuarne il monitoraggio annualmente (Troia & Domina, 2016). Raggiungere specie e habitat di rupi e pendii scoscesi può risultare complesso e rischioso. Quindi, per valutare la consistenza delle due popolazioni ed esplorare agilmente le morfologie complesse dei siti di crescita della specie, abbiamo condotto un'indagine tramite l'uso di UAS (Unmanned Aircraft System).
Le immagini aeree sono state acquisite usando il drone Phantom 4 Professional. Complessivamente, sono stati realizzati 21 voli, tra maggio e giugno del 2022, e acquisite più di 4000 foto, coprendo un'area di circa 0,425 km^2. Utilizzando il software di fotogrammetria Agisoft Metashape, da ogni volo sono state ottenute nuvole dense di punti, modelli digitali della superficie (DSM), ortomosaici e modelli 3D con texture. Le ortofoto e gli ortomosaici sono stati analizzati visivamente per identificare e marcare gli individui di *S. hicesiae*, estrapolandone l'esatta posizione, l'altitudine, la pendenza e l'esposizione. Da questi dati è stato possibile realizzare la mappa di irradianza solare.
Sono stati identificati circa 550 individui ad Alicudi e 400 a Panarea. L'analisi delle ortofoto ha evidenziato percentuali più alte di piante che crescono su rupi e pendii scoscesi ad Alicudi, rispetto a Panarea.
L'esposizione dominante per le due popolazioni è tra Nord-Ovest e Nord-Est, con quella di Alicudi che presenta una concentrazione di piante con esposizione a Nord. *S. hicesiae* ad Alicudi vive prevalentemente su rupi e pendii ombrosi, mentre a Panarea cresce anche nel pianoro soleggiato. La mappa dell'irradianza ha evidenziato, per la popolazione di Alicudi, una significativa preferenza per bassi valori di irradianza solare (tra 200-300 kWh/m^2).
Da quanto ci è noto, questo è il primo studio in cui si è utilizzata la tecnologia UAS per mappare *S. hicesiae*. L'elevato numero di piante identificate ad Alicudi ha dimostrato l'efficacia di tale tecnologia. Infatti, la stima visiva della stessa popolazione riportata in letteratura era di soli 10-30 individui. L'indagine sulle due popolazioni è tuttora in corso, poiché l'intera area di distribuzione potenziale della specie non è stata del tutto indagata. Le indagini condotte nel 2022-2023 rappresentano il punto iniziale per monitorare il cambiamento nel tempo delle due popolazioni attraverso rilievi ripetuti. L'attuale status di rischio IUCN della specie potrebbe essere rivalutato dopo le attività di rafforzamento e monitoraggio messe in atto dal progetto LIFE SEEDFORCE (LIFE20 NAT/IT/001468).

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Conservation and Ethnobotanical Valorization of *Crepis aspromontana* Brullo, Scelsi & Spamp. (Asteraceae), an endemic species of Calabria (Southern Italy)

Patti M., Musarella C.M., Laface V.L.A., Spampinato G.*

Department of AGRARIA, "Mediterranea" University of Reggio Calabria, Loc. Feo di Vito snc, I-89122 Reggio Calabria, Italy.

*Corresponding author: miriam.patti@unirc.it

Crepis aspromontana Brullo, Scelsi & Spamp. is an endemic plant found in southern Calabria belonging to the Asteraceae family; it represents a locally highly valued species of ethnobotanical interest and is known as "*prìcomaruḍḍha*".
According to the information gathered, the leaves of this taxon are consumed as a side dish, by boiling and sautéing them with seasonings, but also used as a decoction to aid digestion; it represents, therefore, an undervalued richness that needs to be valued and preserved to ensure its presence in the future.
Therefore, this study aimed to enhance and conserve *C. aspromontana* through domestication of this species and its cultivation from germplasm collected in the wild.
Initially, a survey was conducted to assess the presence of this taxon in various habitats: it prefers rocky and uncultivated habitats; then, a germplasm collection was made preceded by a population survey by taking morphometric measurements at 10 of the individuals found in the wild, according to the protocol of Bacchetta *et al.* (2006).
Mature seeds were collected in the field, and coarse cleaning was performed by removing the pappus and any residual inflorescence.
Then, an estimate of seed quality was made based on visual assessments, and the results showed that 74% were normal and well developed, 23% were aborted, and 3% were damaged.
Next, to assess viability, a Cut Test, a destructive examination in which seeds are opened longitudinally to evaluate the quality of the endosperm, was performed on a plot of 100 seeds (Gosling, 2013). The seeds selected at the view all appeared uniform and morphologically good; the opened seeds were checked under a microscope and were divided into viable, nonviable, and vain; from the analyses performed, 77 % were found to be viable, 19 % nonviable, and 4% vain.
In accordance with ISTA (2013), the TZ Test, an additional analysis was performed to assess the germinability of the embryos. One hundred and six seeds were opened transversely to expose the endosperm; a 100 mL solution was prepared with 2,3,5,5-Triphenyl-2H-tetrazolium chloride, 98% to 1%, and the seeds were placed in an oven at 30°C in the dark for 6 h.
From the tests performed, 68% were found to be viable, 31.9% were non-viable, and nine were discarded because they were floating.
Following the preliminary tests, germination tests were carried out at three different temperatures (10–15–20–25 °C) to determine the optimal germination temperature.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Conservazione e valorizzazione etnobotanica di *Crepis aspromontana* Brullo, Scelsi & Spamp. (Asteraceae), specie endemica della Calabria (sud Italia)

Patti M., Musarella C.M., Laface V.L.A., Spampinato G.*

Department of AGRARIA, "Mediterranea" University of Reggio Calabria, Loc. Feo di Vito snc, I-89122 Reggio Calabria, Italy

*Corresponding author: miriam.patti@unirc.it

Crepis aspromontana Brullo, Scelsi & Spamp. è una pianta endemica presente nella Calabria meridionale appartenente alla famiglia delle Asteraceae; essa rappresenta una specie di interesse etnobotanico localmente molto apprezzata, ed è conosciuta come "*pricomaruḍḍha*".
In base alle informazioni raccolte, le foglie di questo taxon vengono consumate come contorno, facendole bollire e saltate in padella con condimenti, ma anche utilizzata come decotto per favorire la digestione; rappresenta, quindi, una ricchezza sottovalutata che va valorizzata e preservata, per garantire la sua presenza anche in futuro.
Questo studio ha, quindi, lo scopo di valorizzare e conservare *C. aspromontana* attraverso la domesticazione e la coltivazione di questa specie a partire da germoplasma raccolto in natura.
Inizialmente è stato fatto un sopralluogo per valutare la sua presenza nei vari habitat: predilige habitat rupestri e incolti rocciosi; successivamente è stata fatta una raccolta del germoplasma preceduta da un'indagine della popolazione effettuando delle misure morfo metriche a 10 degli individui trovati in natura in accordo con il protocollo di Bacchetta et al., 2006.
Sono stati raccolti i semi maturi in campo ed è stata fatta una pulizia grossolana eliminando i pappi ed eventuali residui dell'infiorescenza.
È stata effettuata una stima della qualità dei semi basata su valutazioni visive: i risultati ottenuti evidenziano che il 74% sono normali e ben sviluppati, 23% abortiti, e 3% danneggiati.
Successivamente, per valutare la vitalità, è stato eseguito su una parcella di 100 semi il Cut Test, un esame distruttivo, in cui i semi vengono aperti longitudinalmente per valutare la qualità dell'endosperma (Gosling, 2013). I semi selezionati alla vista apparivano tutti uniformi e morfologicamente buoni; i semi aperti sono stati controllati al microscopio per valutarne la qualità e sono stati suddivisi in vitali, non vitali e vani; dalle analisi svolte, il 77% sono risultati vitali, 19% non vitali e 4% vani.
In accordo con ISTA (2013), è stato effettuato il TZ Test, un'ulteriore analisi per valutare la germinabilità degli embrioni. Centosei semi sono stati aperti trasversalmente per far fuoriuscire l'endosperma; è stata preparata una soluzione 100 ml con 2,3,5-Triphenyl-2H-tetrazolium chloride, 98% all'1% e i semi sono stati messi in stufa a 30°C al buio per 6 h.
Dalle analisi svolte, il 68% sono risultati vitali, 31,9% non vitali e 9 sono stati scartati perché galleggiavano.
Successivamente ai test preliminari, sono stati effettuati dei test di germinazione a tre temperature differenti (10° – 15° – 20° – 25° C) per valutare la temperatura ottimale di germinazione.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

The effect of fires in the germination of narrow endemic species: the cases of *Astragalus verrucosus* and *A. maritimus*

Cuena Lombrana A. [1]*, *Dessì L.*[1], *Fois M.*[1], *Meloni F.*[1], *Podda L.*[2], *Porceddu M.*[2], *Bacchetta G.* [1]

[1]Centre for Conservation of Biodiversity (CCB) - Department of Life and Environmental Sciences, University of Cagliari (Italy).
[2]Sardinian Germplasm Bank (BG-SAR) - Hortus Botanicus Karalitanus (HBK), University of Cagliari (Italy).

*Corresponding author: albacuena@gmail.com

Italy is home to a high number of vascular plants of European Union interest (ca. 104 taxa included in Annex II, IV & V Habitats Directive), mainly occurring in the Alpine and in the Mediterranean biogeographic regions. The high rate of endemism entrusts Italy with a high national responsibility for their conservation. However, efforts undertaken over the past 20 years have proven insufficient to ensure a favourable conservation status for these taxa, and significant involvement is still needed. The LIFE SEEDFORCE project has been conceived to fill this gap-mostly - in Italy. To perform these objectives, different methodologies have been shared among 15 project partners with the final goal of implementing concrete conservation actions. Further local solutions were individuated, depending on the species-specific target problems. Here, we present the study case of *Astragalus verrucosus* Moris and *A. maritimus* Moris, two critically endangered species globally known for only one location each in south-western Sardinia. The field activities carried out during the first-year highlighted fires as a potential risk, in addition to the habitat fragmentation, touristic pressures and land use modification detected previously. Information about response of fire-released dormancy or fire-adapted plants for seed germination is fundamental to understanding fire adaptation, particularly in the Mediterranean ecosystem where each year the numbers of fires is increasing. We carried out lab experiments which simulated different fire events. Specifically, to study the effect of fire on seed dormancy release and germination behavior, we performed the dry heat shock with different durations and temperatures exposures before the germination tests. No significantly differences on the germination percentage were detected after the heat shock compared with no treated seed. The limit of both species is 100°C (5 and 10 minutes), increased exposure temperatures cause the seed destruction. It is common in seeds with physical dormancy that rely on heat instead of mechanical stratification to break the water-impermeable seed coat. However, these two narrow endemic species don't show this behaviour and the ability to respond rapidly to conditions favourable for germination in the post fire environment. The physical dormancy of them was not affected by the fire pass, highlighted the no adaptation of them to fire in fire-prone ecosystems like in the Mediterranean regions.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

L'effetto degli incendi nella germinazione di specie endemiche nel Mediterraneo: i casi di *Astragalus verrucosus* e *A. maritimus*

Cuena Lombrana A. [1]*, *Dessì L.*[1], *Fois M.*[1], *Meloni F.*[1], *Podda L.*[2], *Porceddu M.*[2], *Bacchetta G.* [1]

[1]Centre for Conservation of Biodiversity (CCB) - Department of Life and Environmental Sciences, University of Cagliari (Italy).
[2]Sardinian Germplasm Bank (BG-SAR) - Hortus Botanicus Karalitanus (HBK), University of Cagliari (Italy).

*Corresponding author: albacuena@gmail.com

L'Italia ospita un elevato numero di piante vascolari di interesse comunitario (circa 104 taxa inclusi negli allegati II, IV e V della Direttiva Habitat), soprattutto presenti nelle regioni biogeografiche alpine e mediterranee. L'alto tasso di endemismo affida all'Italia un'elevata responsabilità nazionale per la loro conservazione. Tuttavia, gli sforzi intrapresi negli ultimi 20 anni si sono rivelati insufficienti a garantire uno stato di conservazione favorevole per questi taxa, e uno sforzo significativo è ancora necessario. Il progetto LIFE SEEDFORCE è stato concepito per colmare questa lacuna, soprattutto in Italia. Per raggiungere questi obiettivi, sono state condivise diverse metodologie tra i 15 partner del progetto, con l'obiettivo finale di attuare azioni concrete di conservazione. Inoltre, sono state individuate ulteriori proposte/soluzioni locali, a seconda dei problemi specifici delle specie. Qui presentiamo il caso di studio dell'*Astragalus verrucosus* Moris e dell'*A. maritimus* Moris, due specie a rischio critico di estinzione conosciute ciascuna a livello globale in una sola località nella Sardegna sud-occidentale. Le attività sul campo svolte durante il primo anno hanno evidenziato gli incendi come minaccia potenziale, oltre alla frammentazione dell'habitat, alla pressione turistica e alle modifiche dell'uso del suolo evidenziate precedentemente. La conoscenza della possibile risposta attraverso la rottura della dormienza dei semi dopo il fuoco o l'adattazione al fuoco è fondamentale per comprendere l'effetto degli incendi, in particolare nell'ecosistema Mediterraneo, dove ogni anno il numero di incendi aumenta. Abbiamo condotto esperimenti di laboratorio simulando diversi eventi di incendio. In particolare, abbiamo eseguito uno shock termico secco con esposizioni di diversa durata e temperatura prima dei test di germinazione per studiare l'effetto del fuoco sul rilascio della dormienza dei semi e sulla loro risposta alla geminazione post-incendio. Non sono state rilevate differenze significative sulla percentuale di germinazione dopo lo shock termico rispetto ai semi non trattati. Il limite di entrambe le specie è di 100°C (5 e 10 minuti), mentre temperature di esposizione più elevate causano la distruzione dei semi. Questo fenomeno è comune nei semi con dormienza fisica che si affidano al calore invece che alla stratificazione meccanica per rompere il tegumento impermeabile all'acqua. Tuttavia, queste due specie endemiche con un areale molto ristretto non mostrano questa adattazione, né la capacità di rispondere rapidamente alle condizioni favorevoli per la germinazione nell'ambiente post-incendio. La loro dormienza fisica non è stata interrotta dal passaggio del fuoco, evidenziando l'assenza di adattamento al fuoco in ecosistemi a rischio di incendio come quelli delle regioni mediterranee.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Eco-evolutionary causes and consequences of plant species rarity

Nagel Boyd J.[1], Anderson J.T.[2], Brzyski J.[3], Baskauf C.[4], Cruse-Sanders J.[5]*

[1] University of Tennessee at Chattanooga, Chattanooga, Tennessee, USA
[2] University of Georgia, Athens, Georgia, USA
[3] Seton Hill University, Greensburg, Pennsylvania, USA
[4] Austin Peay State University, Clarksville, Tennessee, USA
[5] State Botanical Garden of Georgia, University of Georgia, Athens, Georgia, USA

*Corresponding author: jennifer-boyd@utc.edu

The enduring question of why some species are rare while others are common has important implications for ecological theory, rare species conservation, and overall biodiversity. We used a phylogenetically controlled meta-analysis to investigate eco-evolutionary factors that could influence existing patterns of rarity and elucidate the vulnerability of rare plant species to rapid rates of contemporary environmental change. Specifically, we compared the population genetic diversity, fitness, functional traits, and/or mating systems of 252 rare and 267 common congeneric plant species reported in 154 peer-reviewed articles published from 1978 to 2022. Our findings revealed that rare plant species have reduced population genetic diversity, depressed fitness, and smaller reproductive structures than common congeners and that rare species also could suffer from inbreeding depression and reduced fertilization efficiency. These characteristics may constrain the current abundances, distributions, and/or habitat associations of rare species and suggest that rare species may have reduced capacity for adaptation and migration in the face of environmental change. Our meta-analysis was complicated by the various ways in which rarity can be defined, and we recommend that future studies include more nuanced descriptions of species rarity that could facilitate comparisons and syntheses. We also recommend future studies that include ecologically relevant treatments, such as reciprocal transplant experiments, and quantitative genetic and population genomic analyses. Collectively, such research could improve our understanding of the factors that contribute to rarity and allow for predictions of how rare species are likely to respond to environmental change.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Cause e conseguenze eco-evolutive della rarità delle specie vegetali

Nagel Boyd J.[1], Anderson J.T.[2], Brzyski J.[3], Baskauf C.[4], Cruse-Sanders J.[5]*

[1] University of Tennessee at Chattanooga, Chattanooga, Tennessee, USA
[2] University of Georgia, Athens, Georgia, USA
[3] Seton Hill University, Greensburg, Pennsylvania, USA
[4] Austin Peay State University, Clarksville, Tennessee, USA
[5] State Botanical Garden of Georgia, University of Georgia, Athens, Georgia, USA

*Corresponding author: jennifer-boyd@utc.edu

La costante domanda sul perché alcune specie sono rare mentre altre sono comuni ha importanti implicazioni nelle teorie ecologiche, nella conservazione delle specie rare e in generale nella biodiversità. Abbiamo utilizzato una meta-analisi filogeneticamente controllata per studiare i fattori eco-evolutivi che potrebbero influenzare i modelli esistenti di rarità e chiarire la vulnerabilità delle specie vegetali rare agli attuali rapidi tassi di cambiamento ambientale. In particolare, abbiamo confrontato la diversità genetica della popolazione, la fitness, i tratti funzionali e/o sistemi di accoppiamento di 252 specie rare e 267 specie congeneriche comuni riportate in 154 articoli revisionati pubblicati dal 1978 al 2022. I nostri risultati mostrano che le specie vegetali rare hanno una ridotta diversità genetica all'interno della popolazione, una fitness depressa e strutture riproduttive più piccole rispetto ai congeneri comuni e che potrebbero soffrire di impoverimento da consanguineità e ridotta fecondazione. Queste caratteristiche possono limitare l'attuale abbondanza, distribuzione e/o associazione di habitat di specie rare e suggeriscono che esse abbiano una minore capacità di adattamento e di migrazione di fronte al cambiamento ambientale. La nostra meta-analisi è stata complicata dalle diverse definizioni di rarità trovate, consigliamo che studi futuri includano descrizioni più generali della rarità in modo da facilitare confronti e sintesi. Raccomandiamo inoltre che studi futuri includano trattamenti ecologicamente pertinenti, come esperimenti di trapianto reciproco e analisi genetiche quantitative e genomiche di popolazione. In sintesi, questo studio potrebbe migliorare la nostra comprensione dei fattori che contribuiscono alla rarità di una specie e consentire di prevedere quanto siano capaci le specie rare a rispondere al cambiamento ambientale.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Automated Detection and Classification of Invasive Cardiospermum grandiflorum using Multispectral Orthophotos and Deep Learning Models in Wied Babu, Malta

Lamoliere A.[1], Mifsud M.[2], Abela J.[2], Tavilla G.[3], Roy R.G.[4], Lanfranco S.[4], Mifsud D.[1]*

[1]Institute of Earth Systems, University of Malta, Msida, Malta.
[2]Faculty of Information & Communication Technology, University of Malta, Msida, Malta.
[3]Dept. of Biological, Geological and Environmental Sciences, University of Catania, Catania, Italy.
[4]Department of Biology, University of Malta, Msida, Malta.

*Corresponding author: arthur.lamoliere@um.edu.mt

The use of Unmanned Aerial Vehicles (UAV) mounted with Multispectral cameras has significantly improved the field of remote sensing and currently allows ecological monitoring and mapping of vegetation cover to an unprecedented scale. With UAV-based multispectral orthophotos, it is now possible to classify and identify plant species based on their spectral signatures by using the discrimination potential of the cameras exploiting the Infra-Red spectrum. This study explores the use of Deep Learning Models on multispectral orthophotos for monitoring and mapping of the distribution range of the highly Invasive Alien Plant species (IAPs) Showy Balloon Vine (Cardiospermum grandiflorum Sw.) in the watershed of Wied Babu, Malta. It is a short, dry and steep valley situated on the South-West Coast of Malta. The entire catchment area of the valley is part of the largest Special Area of Conservation (SAC) of the Maltese Islands: Rdumijiet ta' Malta: Ir-Ramla taċ-Ċirkewwa sal-Ponta ta' Bengħisa. In this paper, we acquired multispectral imagery of the study area using a DJI Phantom 4 UAV mounted with a multispectral camera (Red, Green, Blue, Red-Edge, Near Infra-Red channels) besides the regular Red-Green-Blue (RGB) camera. The orthophotos were processed using Aegisoft Metashape software to generate dense cloud points and ortho mosaic which were subsequently classified using a Deep Learning Model model. The model is being trained on a dataset of vegetation cover dominated by C. grandiflorum. Based on its unique spectral signature, the current classification method was able to discriminate against C. grandiflorum, which is characterised by a pale light green foliage in visible light and high reflectance in the NIR region. Using Deep Learning Models on multispectral orthophotos for monitoring and mapping of C. grandiflorum in Wied Babu has several advantages over traditional methods as it minimises trampling of vegetation from surveyors, provides a reliable and time-effective, therefore cost-effective, method of monitoring and provides a repeatable method for long term monitoring. In conclusion, our study shows the potential of using Deep Learning models on multispectral orthophotos for monitoring and mapping IAPs to high accuracy levels. The application of this technology can significantly improve decision-making in the management phase of any physical intervention by providing an accurate insight into the spatial distribution of the target species.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Détection et classification automatisées de Cardiospermum grandiflorum invasif à l'aide d'orthophotos multispectrales et de modèles d'apprentissage en profondeur à Wied Babu, Malte

Lamoliere A.[1], Mifsud M.[2], Abela J.[2], Tavilla G.[3], Roy R.G.[4], Lanfranco S.[4], Mifsud D.[1]*

[1]Institute of Earth Systems, University of Malta, Msida, Malta.
[2]Faculty of Information & Communication Technology, University of Malta, Msida, Malta.
[3]Dept. of Biological, Geological and Environmental Sciences, University of Catania, Catania, Italy.
[4]Department of Biology, University of Malta, Msida, Malta.

*Corresponding author: arthur.lamoliere@um.edu.mt

L'utilisation de drones équipés de caméras multispectrales a considérablement amélioré le domaine de la télédétection et permet actuellement le suivi écologique et la cartographie de la couverture végétale à une échelle sans précédent. Grâce aux orthophotos multispectrales obtenues par drone, il est désormais possible de classifier et d'identifier les espèces végétales en utilisant leurs signatures spectrales, en exploitant le potentiel de discrimination des caméras dans le spectre infrarouge. Cette étude explore l'utilisation de modèles de Deep Learning sur des orthophotos multispectrales pour la surveillance et la cartographie de la répartition de l'espèce végétale invasive Cardiospermum grandiflorum Sw., 1788 dans le bassin versant de Wied Babu, à Malte. Il s'agit d'une vallée courte, sèche et escarpée située sur la côte sud-ouest de l'île de Malte. L'ensemble du bassin versant fait partie de la plus grande zone spéciale de conservation (ZSC) de l'archipel Maltais : Rdumijiet ta' Malta : Ir-Ramla taċ-Ċirkewwa sal-Ponta ta' Bengħisa. Dans cette étude, nous avons acquis des images multispectrales de la zone d'étude à l'aide d'un drone DJI Phantom 4 équipé d'une caméra multispectrale (canaux rouge, vert, bleu, Red-edge, proche infra-rouge) en plus de la caméra RVB standard. Les orthophotos ont été traitées à l'aide du logiciel Agisoft Metashape pour générer des nuages de points denses et une orthomosaïque qui ont ensuite été classés à l'aide d'un modèle de Deep Learning. Le modèle est entraîné sur un ensemble de données de couverture végétale dominée par C. grandiflorum. Grâce à sa signature spectrale unique, la méthode de classification actuelle a pu discriminer C. grandiflorum, qui se caractérise par un feuillage vert clair pâle dans la lumière visible et une réflectance élevée dans la région de l'infrarouge proche. L'utilisation de modèles de Deep Learning sur des orthophotos multispectrales pour la surveillance et la cartographie de C. grandiflorum à Wied Babu présente plusieurs avantages par rapport aux méthodes traditionnelles, car elle minimise le piétinement de la végétation lors des relevés de terrains, fournit une méthode fiable et efficace en termes de temps, donc rentable, pour le suivi écologique et offre une méthode reproductible pour la surveillance à long terme. En conclusion, notre étude montre le potentiel d'utilisation de modèles d'apprentissage profond sur des orthophotos multispectrales pour le suivi écologique et la cartographie des espèces végétales invasives avec des niveaux de précision élevés. L'application de cette technologie peut considérablement améliorer la prise de décision dans la phase de gestion de toute intervention physique en fournissant un aperçu précis de la distribution spatiale de l'espèce cible.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

The teaching of the phytosociological method and its influence on a sustainable socioeconomic development

*Cano-Ortiz A.[1], Musarella C.M.[2], Quinto Canas R.[3], Piñar Fuentes J.C.[1], Meireles C.[4], Raposo M[4]., Pinto Gomes C.J. [4], Spampinato G.[2], Cano E. [5]**

[1]Department of Didactics of Experimental, Social and Matematical Sciences. UCM, Madrid, Spain
[2]Department of AGRARIA, "Mediterranea" University of Reggio Calabria, Reggio Calabria, Italy
[3]Faculty of Sciences and Technology, University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal. Centre of Marine Sciences (CCMAR), University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal
[4]Department of Landscape, Environment and Planning, Institute for Mediterranean Agrarian and Environmental Sciences (ICAAM), University of Évora (Portugal), Évora, Portugal
[5]Department of Animal and Plant Biology and Ecology, Section of Botany, University of Jaén, Jaén, Spain

*Corresponding author: ecano@ujaen.es

The study of the phytosociological method was born in the Central European school with very prestigious researchers such as Braun-Blanquet, Tüxen, Oberdorfer, Rivas Goday, Rivas-Martínez, Quezel, Ellemberg, Géhu, Tomaselli, Guinochet. Currently, Phytosociology presents a great boom in Europe, with different associations in different countries, which apply the phytosociological method in the study of vegetation. This method applied in the sense of the Central European school, not only allows to have a knowledge of the ecology, distribution and floristics of the plant communities, but also allows to know the plant dynamics and the state of conservation of the communities. Plant dynamics is currently becoming important to elucidate the climax of a territory, which, together with Bioclimatology and Biogeography, is essential in forest and agricultural management models, making the series of vegetation the fundamental unit for territorial management, both in regarding the conservation of habitats as well as for a sustainable socioeconomic development. In this sense, the implementation of geobotanical studies in research centers and universities is essential, with the aim of training future environmental managers. Knowledge of sampling techniques, data processing, community flora, etc. is therefore necessary. As well as the knowledge of plant dynamics, to know exactly the series of vegetation, this being the basis of all territorial planning, both forestry and agronomic. At this moment there is a strong scientific advance in terms of European syntaxonomic studies, which are a consequence of the geobotanical studies of the 20th century. Although in this century there are already applied geobotanical studies, it is necessary to insist on them, since sustainable development inevitably goes through management models, in which Phytosociology is basic.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

La enseñanza del método fitosociológico y su influencia en un desarrollo socioeconómico sostenible

*Cano-Ortiz A.[1], Musarella C.M.[2], Quinto Canas R.[3], Piñar Fuentes J.C.[1], Meireles C.[4], Raposo M[4]., Pinto Gomes C.J. [4], Spampinato G.[2], Cano E. [5]**

[1]Department of Didactics of Experimental, Social and Matematical Sciences. UCM, Madrid, Spain.
[2]Department of AGRARIA, "Mediterranea" University of Reggio Calabria, Reggio Calabria, Italy
[3]Faculty of Sciences and Technology, University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal. Centre of Marine Sciences (CCMAR), University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal.
[4]Department of Landscape, Environment and Planning, Institute for Mediterranean Agrarian and Environmental Sciences (ICAAM), University of Évora (Portugal), Évora, Portugal.
[5]Department of Animal and Plant Biology and Ecology, Section of Botany, University of Jaén, Jaén, Spain.

*Corresponding author: ecano@ujaen.es

El estudio del método fitosociológico nace en la escuela centroeuropea con investigadores muy prestigiosos como Braun-Blanquet, Tüxen, Oberdorfer, Rivas Goday, Rivas-Martínez, Quezel, Ellemberg, Géhu, Tomaselli, Guinochet. Actualmente la Fitosociología presenta un gran auge en Europa, con diferentes asociaciones en los diversos países, que aplican el método fitosociológico en el estudio de la vegetación. Este método aplicado en el sentido de la escuela Centroeruopea, no solo permite tener un conocimiento de la ecología, distribución y florística de las comunidades vegetales, sino que también permite conocer la dinámica vegetal y el estado de conservación de las comunidades. Actualmente cobra importancia la dinámica vegetal para dilucidar la climax de un territorio, lo que, junto a la Bioclimatología y Biogeografía es imprescindible en los modelos de gestión forestal y agrícola, convirtiéndose la serie de vegetación en la unidad fundamental para la gestión territorial, tanto en lo que respecta a la conservación de hábitats como para un desarrollo socioeconómico sostenible. En este sentido es fundamental la implantación de los estudios geobotánicos en centros de investigación y universidades, con el objetivo de formar a los futuros gestores ambientales. Es pues necesario el conocimiento de las técnicas de muestreo, el tratamiento de datos, florística de las comunidades etc. Así como el conocimiento de la dinámica vegetal, para saber exactamente la serie de vegetación, siendo esta la base de toda ordenación territorial, tanto forestal como agronómica. En este momento hay un fuerte avance científico en cuanto a estudios sintaxonómicos europeos, que son consecuencia de los estudios geobotánicos del siglo XX. Aunque en este siglo ya hay estudios geobotánicos aplicados, es necesario insistir en ellos, puesto que el desarrollo sostenible pasa irremediablemente por modelos de gestión, en los que la Fitosociología es básica.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Eco-education through biosphere reserves

Cano-Ortiz A.[1]*, *García García E.*[1], *García Yelo B.A.*[1]

[1] *Department of Didactics of Experimental, Social and Mathematical Sciences. Complutense University of Madrid, Faculty of Education, Rector Royo Villanova s/n, Ciudad Universitaria, 28040 Spain;*

*Corresponding author: acano07@ucm.es

In nature there are different botanical-ecological values, everything depends on whether we are in natural, semi-natural or anthropized territories, obviously the more human influence there is, the lower the botanical-ecological values, due to the destruction of ecosystems by man. In order to be able to correctly interpret the natural environment and for the student to know how to differentiate between what really needs to be protected and what is of less botanical value, practical teaching is advisable. Educating on the basis of current ecological challenges, in an affordable way, developing skills such as strength, resilience, and scientific literacy, is one of the challenges we face today. We present a model of education to achieve this, based on the integration of emotional, social and ecological intelligence. For this purpose, the Biosphere Reserves meet the ideal conditions, specialized in conservation, environmental education, management and research of the natural environment, as well as sustainable development. These natural spaces act as a reservoir of species, as well as promote the economic development of the territory. On the other hand, these areas have a high value from an educational point of view, since they allow the teacher to teach about species and ecosystems from a social perspective, combining the concepts of conservation and social development. The existence of a network of Biosphere Reserves allows the teacher to obtain quick information on what he/she wants to teach the students. Thus in the various Biosphere Reserves it is possible to study species of high botanical value, as well as the existence of different ecosystems of interest, depending on the zoning and location of the Biosphere Reserve under study, such as the Mediterranean dry forest and succulent thicket of acacias and thorny brooms in the Biosphere Reserve of Fuerteventura. Therefore, Biosphere Reserves act as areas of special protection because they contain botanical-ecological values of interest, in this sense they can serve the teacher as a field laboratory for teaching plant species and communities, being these places of interest where the concepts of plant diversity, plant association, plant dynamics can be taught, and didactic methodologies aimed at eco-education can be applied.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Eco-educación a traves de las reservas de la biosfera

Cano-Ortiz A.[1]*, *García García E.*[1], *García Yelo B.A.*[1]

[1] *Department of Didactics of Experimental, Social and Mathematical Sciences. Complutense University of Madrid, Faculty of Education, Rector Royo Villanova s/n, Ciudad Universitaria, 28040 Spain;*

*Corresponding author: acano07@ucm.es

En la naturaleza existen valores botánicos ecológicos diferentes, todo depende de que nos encontremos ante territorios naturales, seminaturales o antropizados, evidentemente cuanto más influencia humana exista, menores son los valores botánico-ecológicos, debido a la destrucción de los ecosistemas por el hombre. Para poder interpretar correctamente el medio natural y que el alumno sepa diferenciar lo que realmente debe protegerse, frente a aquello que presenta menor valor botánico, es conveniente una enseñanza práctica. Educar en base a los desafíos ecológicos actuales, de una forma asequible, desarrollando habilidades como la fortaleza, la resiliencia, y la alfabetización científica, es uno de los retos a los que nos enfrentamos hoy en día. Presentamos un modelo de educación para lograrlo, basado en la integración de la inteligencia emocional, social y ecológica. Para ello las Reservas de Biosfera, reúnen las condiciones ideales, especializadas en conservación, educación ambiental, gestión e investigación del medio natural, así como desarrollo sostenible. Estos espacios naturales actúan como reservorio de especies, así como promueven el desarrollo económico del territorio. Por otra parte, dichos espacios tienen un elevado valor desde el punto de vista educativo, puesto que permite al profesor la enseñanza de especies y ecosistemas desde la perspectiva más social, aunando los conceptos de conservación y desarrollo social. La existencia de una Red de Reservas de la Biosfera permite al profesor la obtención de información rápida sobre aquello que quiera enseñar al alumnado. Así en las diversas Reservas de la Biosfera es posible estudiar especies de elevado valor botánico, como la existencia de diferentes ecosistemas de interés, dependiendo de la zonificación y localización de la Reserva de la Biosfera de estudio, tal como el bosque seco mediterráneo y matorral suculento de acacias y erguenes en la Reserva de la Biosfera de Fuerteventura. Por lo tanto las Reservas de Biosfera actúan como áreas de especial protección por encerrar valores botánico-ecológicos de interés, en este sentido pueden servir al profesor como laboratorio de campo para la enseñanza especies y comunidades vegetales, siendo estos lugares de interés donde se puede enseñar los conceptos de diversidad vegetal, asociación vegetal, dinámica vegetal, y aplicar metodologías didácticas dirigidas a la ecoeducación.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

The importance of geobotany in habitat restoration

Pinto Gomes C. [1,2,3]*, *Baião C.*[2,3], *Ferreira L.*[2,3], *Meireles C.*[2,3]

[1]University of Évora – MED Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute; ICT – Institute of Earth Sciences; School of Science and Technology, Évora, Portugal
[2]University of Évora – MED Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute; Portugal, Évora
[3]University of Évora, School of Science and Technology, Portugal, Évora

*Corresponding author: cpgomes@uevora.pt

Geobotany is a scientific discipline that allows us to characterize in detail any territory on the globe, namely at the Bioclimatological and Biogeographical level.
Based on geobotanical knowledge, as well as other areas of natural science, it is possible to assess the conservation status of different habitats, as well as the plant potential of each surface of different territories. In this sense, geobotanical knowledge is essential, and even indispensable, to efficiently restore and enhance natural and semi-natural habitats in a poor state of conservation.
In this presentation, some concrete examples of environmental restoration, already developed and in the process of being developed, in different areas of the Portuguese territory will be given.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Importância da Geobotânica no restauro de habitats

Pinto Gomes C. [1,2,3]*, *Baião C.*[2,3], *Ferreira L.*[2,3], *Meireles C.*[2,3]

[1]University of Évora – MED Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute; ICT – Institute of Earth Sciences; School of Science and Technology, Évora, Portugal
[2]University of Évora – MED Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute; Portugal, Évora
[3]University of Évora, School of Science and Technology, Portugal, Évora

*Corresponding author: cpgomes@uevora.pt

A Geobotânica é uma disciplina científica que nos permite caraterizar em pormenor qualquer território do globo, nomeadamente ao nível Bioclimatológico e Biogeográfico.
Com base no conhecimento geobotânico, bem como noutras áreas das ciências naturais, é possível avaliar o estado de conservação de diferentes habitats, bem como o potencial vegetal de cada superfície de diferentes territórios.
Neste sentido, o conhecimento geobotânico é essencial, e mesmo indispensável, para recuperar e valorizar eficazmente habitats naturais e semi-naturais em mau estado de conservação.
Nesta apresentação, serão dados alguns exemplos concretos de restauro ambiental, já desenvolvidos e em vias de desenvolvimento, em diferentes áreas do território português.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

The reinvention of xerophile gardens in the Algarve using xeromorphic succulents

Xarepe D. [1]*, *Musarella C.M.*[2], *Pinto Gomes C.J.*[3] *Quinto Canas R.*[1]

[1] Faculty of Sciences and Technology, University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal.
[2] Department of AGRARIA, "Mediterranea" University of Reggio Calabria, Reggio Calabria, Italy
[3]Department of Landscape, Environment and Planning, Institute for Mediterranean Agrarian and Environmental Sciences (ICAAM), University of Évora (Portugal), Évora, Portugal.

*Corresponding author: a47383@ualg.pt

Considering the current climate conjuncture, it is a consensus that green spaces in large contemporary urban areas should be increasingly more numerous and simultaneously more sustainable, being adapted to the edaphoclimatic conditions of the site, and with reduced maintenance costs. In the case of Algarve, where the research of this dissertation is focused, the current and future water availability, assumes a preponderant role in the design of green spaces, where the demands mentioned above can only be achieved if we deviate from conventional landscape practices and develop holistic strategies of management and design of green spaces that integrate different areas of knowledge and not merely aesthetic issues. In this context, this research aims to develop landscaping practices more adapted and resilient to the current and future climatic conditions of the Algarve, thus reinventing the concept of landscaping in the south of Portugal. Currently, the climate change effects all regions around the world, being the Mediterranean region particularly susceptible to more intense drought over an extended period. This work aims to promote xerophytic gardens using non-invasive xeromorphic succulents, compatible with the edaphoclimatic characteristics of the Algarve.
In this work we present, two xerophytic landscaping projects, one in the private other in the public scheme since the concept to implementation of both presents different approaches. However, the common feature of these two projects are the species perfectly adapted to long periods of drought, which, according to the predictions of recent climatic models, will tend to worsen in the Algarve. The 21st century will be marked by climate change, making it necessary to promote sustainability and resilience in landscape architecture projects, in order to make them more multifunctional and perfectly fit into the surrounding landscape.
The xeromorphic succulents are a group of plants from different taxonomic families with very specific characteristics, one of the most relevant being their succulence, that is, their capacity to store water for long periods. Throughout millions of years of evolution, xeromorphic succulents have developed various strategies, to colonize areas under extreme conditions, especially areas with desertic bioclimatic belts. Studies on these mechanisms of tolerance to water stress are increasingly frequent, which could be advantageous in landscaping projects and our adaptation to future climatic challenges. In addition, the ornamental potential of xeromorphic succulents is enormous, since their bold forms and panoply of colours appeal to the senses, which, combined with their morphological characteristics and physiological mechanisms, make them strong options to the reconversion or creation of xerophilous gardens in Algarve.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

A reinvenção dos jardins xerófilos no Algarve com recurso às suculentas xeromórficas

Xarepe D. [1]*, *Musarella C.M.*[2], *Pinto Gomes C.J.*[3] *Quinto Canas R.*[1]

[1] Faculty of Sciences and Technology, University of Algarve, Campus de Gambelas, 8005-139 Faro, Portugal.
[2] Department of AGRARIA, "Mediterranea" University of Reggio Calabria, Reggio Calabria, Italy
[3]Department of Landscape, Environment and Planning, Institute for Mediterranean Agrarian and Environmental Sciences (ICAAM), University of Évora (Portugal), Évora, Portugal.

*Corresponding author: a47383@ualg.pt

Tendo em conta a atual conjuntura climática, é um consenso de que os espaços verdes nas grandes machas urbanas contemporâneas devem ser cada vez mais numerosos e simultaneamente mais sustentáveis, estando adaptados às condições edafoclimáticas do local, e com custos de manutenção reduzidos. No caso do Algarve, onde a investigação desta dissertação se centra, a disponibilidade hídrica atual e futura, assume um papel preponderante na conceção de espaços verdes, onde as exigências acima mencionadas só poderão ser concretizadas se nos desviarmos de práticas paisagistas convencionais e desenvolvermos estratégias holísticas de gestão e conceção dos espaços verdes que integrem diferentes área do conhecimento e não meramente as questões estéticas. Neste contexto, este trabalho tem como objetivo desenvolver práticas paisagistas mais adaptadas e resilientes às condições climáticas do Algarve, reinventando assim o conceito de jardim nesta região de Portugal. Atualmente os efeitos das alterações climáticas fazem se sentir por todo o mundo, sendo a região mediterrânica particularmente suscetível aos fenómenos de seca prolongados. Este trabalho visa a promoção de jardins xerófilos com recurso às suculentas xeromórficas, não invasivas, compatíveis com as características edafoclimáticas do Algarve.

Neste trabalho são apresentados dois projetos paisagistas xerófitas, um na esférica privada outro na esfera pública, uma vez que o conceito de implementação de ambos é diferente. Porém o denominador comum destes dois projetos são as espécies perfeitamente adaptadas à seca, que segunda as previsões de modelos climáticos recentes, terá tendência a se agravar no Algarve. O século XXI será marcado pela mudança climática, tornando se necessário promover a sustentabilidade e resiliência dos projetos de arquitetura paisagista, de forma a torná-los mais multifuncionais e perfeitamente enquadrados à paisagem envolvente.

As suculentas xeromórficas constituem um grupo de plantas, de diferentes famílias taxonómicas, com características bem específicas, sendo a suculência, ou seja, a sua capacidade de armazenar água durante longos períodos, umas das mais relevantes. Ao longo de milhões de anos de evolução, as suculentas xeromórficas, foram desenvolvendo diversas estratégias, de forma a colonizar áreas sob condições extremas de aridez, especialmente as áreas desérticas. Estudos sobre estes mecanismos de tolerância ao stress hídrico são cada vez mais frequentes, o que poderá se mostrar vantajoso na nossa adaptação aos desafios climáticos futuros. Além disso, o potencial ornamental das suculentas xeromórficas é enorme, uma vez que as suas formas arrojadas e panóplia de cores são uma verdadeira explosão sensorial, que aliada às suas características morfológicas e mecanismo fisiológicos as torna efetivamente espécies uma opção na reconversão ou criação de jardins xerófilos.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Education on the carbon footprint of future teachers: a practical proposal

García García E. [1]*, Cano-Ortiz A. [1], García Buitrago E.[1], García Yelo B.A. [1]

[1] *Department of Didactics of Experimental, Social and Mathematical Sciences. Complutense University of Madrid, Faculty of Education, Rector Royo Villanova s/n, Ciudad Universitaria, 28040 Spain;*

*Corresponding author: euggarci@edu.ucm.es

The concerning environmental situation of our planet should be materialized into concrete actions, not only by governmental actions, but also at citizen level. Commitment without knowledge of our daily actions effects is difficult, that is why scientific literacy among citizens is necessary. Children and adolescent educators have the important task of ecosocially educating their students, but first they must be trained. A study is presented on the carbon literacy of 127 preservice teachers of the Faculty of Education-CFP (UCM), who responded to a validated questionnaire of open answers, in order to record their perception on actions that contribute to their Carbon footprint and how to reduce and compensate it. The results showed that only 20% of the students know the meaning of the "carbon footprint" and less than 10% know how to compensate their emissions. However, most of them mention several actions that contribute to it, limiting themselves to the most known (motor transport, energy (heat and electricity)); while only a few highlights overconsumption (of clothing, technological products and meat).
Significant learning is higher with experiential learning than with what is acquired in a transmissive way. Consequently, we proposed a series of activities related to the "carbon footprint" of the students and its compensation.
1st Every Student calculated their CO2 emissions over a year by using several carbon calculators (ceroco2, reutilizayevitaco2) based on data on electricity, heating and hot water consumption, distance travelled by different means of transportation, their diet, their consumption clothes, books, etc. Every student recorded their emissions per activity in an Excel sheet hosted on the Virtual Campus. 2nd Forming small groups (4-5 students), the students appraisal on both, individual and whole group data, sharing their conclusions with the whole group. It is worth highlighting the great impact of those students who frequently travelled by plane, compared to the low impact of those who used to walk or those with a vegetarian diet as opposed to those who usually ate meat. 3rd The terms "carbon compensation" and "CO2 sink" were introduced, associating them to the process of plant nutrition, so it is easy to include this proposal in the DU on plants, since they are one of the main CO2 sinks. The ecological value of plants is well known, although it is not usually quantified, it is proposed to determine the number of individuals of each species necessary to compensate the impact of GG of the whole group, knowing the fixing power of each tree. It is a highly effective activity at school level to end up reflecting on the importance of the conservation of plant species and the needs for revegetation of the planet.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Educación en la huella de carbono de futuros docentes: una propuesta práctica

García García E. [1]*, Cano-Ortiz A. [1], García Buitrago E.[1], García Yelo B.A. [1]

[1] *Department of Didactics of Experimental, Social and Mathematical Sciences. Complutense University of Madrid, Faculty of Education, Rector Royo Villanova s/n, Ciudad Universitaria, 28040 Spain;*

*Corresponding author: euggarci@edu.ucm.es

La preocupante situación medioambiental en la que se encuentra nuestro planeta debe plasmarse en acciones concretas, no sólo gubernamentales, sino también de forma individualizada, como ciudadanos. Resulta difícil comprometerse sin conocer el efecto de nuestras acciones cotidianas, por lo que se hace necesaria una alfabetización científica de la ciudadanía. Quienes tienen la labor de formar a los niños y adolescentes, tienen la importante tarea de educarles ecosocialmente, pero antes es preciso formarles. Se presenta un estudio sobre la alfabetización sobre la huella de carbono de 127 estudiantes de Magisterio de la Facultad de Educación-CFP (UCM), quienes respondieron a un cuestionario validado de respuestas abiertas, con el fin de recoger su percepción acerca de las acciones que contribuyen a su huella de carbono y cómo reducirla y compensarla. Los resultados son preocupantes. sólo un 20% conoce el significado de la "huella de carbono" y menos del 10% sabe cómo compensar sus emisiones. Sin embargo, la mayoría mencionan varias acciones que contribuyen a la misma, limitándose a las más conocidas (transporte a motor, energía (calorífica y eléctrica)); mientras que sólo unos pocos resaltan el sobreconsumo (de ropa, productos tecnológicos o de carne).
Dado que está ampliamente demostrado que se aprende de forma mucho más significativa con lo que se experimenta en primera persona que con lo que se adquiere de forma transmisiva, se propuso una serie de actividades relacionadas con la "huella de carbono" del alumnado y su compensación.
1ª Cada estudiante realizó el cálculo de sus emisiones de CO2 a lo largo de un año, mediante el uso de varias calculadoras de carbono (ceroco2, reutilizayevitaco2) a partir de datos sobre consumo eléctrico, de calefacción y de agua caliente, los km realizados en los diferentes medios de transportes, su tipo de dieta alimentaria, el consumo de ropa, libros, etc. Cada estudiante anotó sus emisiones por actividad en una hoja Excel alojada en el Campus Virtual. 2ª Consistió en una reflexión en pequeño grupo (4-5 estudiantes) partiendo de los datos tanto individuales como del grupo entero y una posterior puesta en común de estas reflexiones. A resaltar el gran impacto de aquellos estudiantes que realizaban frecuentes viajes en avión, comparados con la baja repercusión de los que acostumbraban a ir andando o de aquellos que tenían una dieta vegetariana frente a los que habitualmente comían carne. 3ª Se introdujeron los términos "compensación de las emisiones" y "sumidero de CO2" asociándolos al proceso de nutrición vegetal, lo que facilita la inclusión de esta propuesta en la UD de las plantas, ya que son unos de los principales sumideros de CO2. El valor ecológico de plantas es de sobra conocido, aunque no es habitual cuantificarlo, se propone determinar el número de individuos de cada especie con los necesarios para compensar el impacto de GE de todo el grupo, conociendo el poder de fijación de cada árbol. Es una actividad muy efectiva a nivel escolar para acabar reflexionando sobre la importancia de la conservación de las especies vegetales y de la necesidad de revegetación del planeta.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Inclusion of records of in situ crop wild relatives from Apulia and Basilicata regions (Southern Italy) in EURISCO

*Tomaselli V.[1], Direnzo P.[2], Laghetti G.[2], De Paola D.[2]**

[1] Department of Biosciences,Biotechnologies and Environment, University of Bari "Aldo Moro", Bari, Italy
[2] Institute of Biosciences and BioResources, National Research Council of Italy (IBBR-CNR), Bari, 70126, Italy

*Corresponding author: domenico.depaola@ibbr.cnr.it

The crop wild relatives (CWR) of domesticated plants, as well as species more or less closely related to them, constitute an increasingly important resource for improving agricultural production (Bohra et al., 2021) and for maintaining sustainable agroecosystems (Heywood et al. 2007), especially in relation to climate change (Müller et al. 2021). Considerable efforts have been deployed in the last decades to collect CWR and maintain them ex situ. More recently, both scientific and agricultural community have turned more attention towards integrated or complementary conservation as a better way to preserve CWR, with more emphasis on in situ conservation. In fact, in order to capture the diversity of wild populations suitable for crop improvement, these populations need to thrive in their natural habitats and adapt to changing environmental conditions (Meilleur & Hodgkin 2004; Engels & Thormann 2020). CWR native in Europe are related to the many socio-economically important crops and therefore they are important resources for the maintenance of food security and crop production in the region. Many EU countries have drawn up National CWR checklists and priority lists, with the implementation of national CWR conservation strategies and action plans (Labokas et al 2018). Italy was recently included in the project "Extension of EURISCO for Crop Wild Relatives (CWR) in situ data and preparation of pilot countries' data sets". In the framework of this project, a list of priority taxa and related populations were identified within Apulia and Basilicata regions, to be monitored and assessed in terms of conservation status. Information will be collected and organized according to the guidelines of the EURISCO database.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Inserimento in EURISCO di record in situ di parenti selvatici di piante coltivate presenti in Puglia e Basilicata (Italia meridionale)

*Tomaselli V.[1], Direnzo P.[2], Laghetti G.[2], De Paola D.[2]**

[1] Department of Biosciences,Biotechnologies and Environment, University of Bari "Aldo Moro", Bari, Italy
[2] Institute of Biosciences and BioResources, National Research Council of Italy (IBBR-CNR), Bari, 70126, Italy

*Corresponding author: domenico.depaola@ibbr.cnr.it

I parenti selvatici (Crop Wild Relatives - CWR) delle piante domesticate di interesse agrario, così come le specie ad esse più o meno strettamente correlate, costituiscono una risorsa sempre più importante per il miglioramento della produzione agricola (Bohra et al., 2021) e per il mantenimento di agroecosistemi sostenibili (Heywood et al. 2007), soprattutto in relazione ai cambiamenti climatici (Müller et al. 2021). Negli ultimi decenni sono stati compiuti notevoli sforzi per reperire le CWR e conservarle ex situ. Più recentemente, sia la comunità scientifica che quella delle imprese agricole hanno rivolto maggiore attenzione alla conservazione delle CWR, ponendo maggiore enfasi su quella in situ. Infatti, per mantenere la diversità delle popolazioni di specie selvatiche utili al miglioramento delle colture agrarie, queste devono prosperare nei loro habitat naturali e adattarsi alle mutevoli condizioni ambientali (Meilleur & Hodgkin 2004; Engels & Thormann 2020).
Le CWR originarie dell'Europa sono legate a numerose colture agrarie, importanti dal punto di vista socio-economico e pertanto risorse cruciali per il mantenimento della sicurezza alimentare e della produzione agricola. Molti paesi dell'UE hanno elaborato liste di controllo e liste di priorità nazionali per le CWR, con l'attuazione di strategie e piani d'azione nazionali per la loro conservazione (Labokas et al 2018). L'Italia è stata recentemente inclusa nel progetto "Estensione di EURISCO per i dati in situ delle Crop Wild Relatives (CWR) e preparazione dei data-set dei paesi pilota". Nell'ambito di questo progetto, è stato individuato un elenco di taxa prioritari e delle relative popolazioni presenti in alcune regioni italiane come la Puglia e la Basilicata, da monitorare e valutare in termini di "stato di conservazione". Le informazioni saranno raccolte e organizzate secondo le linee guida del database EURISCO.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Annotated checklist of Mediterranean wild edible plants: understanding the diversity of an overlooked resource

Gori B.[1,2,3,4]*, *Porceddu M.*[1,3,4], *Ulian T.*[2], *Bacchetta G.*[1,3,4]

[1]Università degli Studi di Cagliari (Sardinia, Italy)
[2]Royal Botanic Gardens, Kew. (London, United Kingdom)
[3]Centre for Biodiversity Conservation (CCB)
[4]Sardinian Germplasm Bank (BG-SAR)

*Corresponding author: benedetta.gori@unica.it

Traditional Mediterranean food systems have always been demarcated by the practice of gathering and consuming Wild Edible Plants (WEPs). However, major socio-economic transformations have brought the progressive abandonment of such practice over the past few decades, together with increasing degradation of the natural habitats WEPs are usually found in. Today, significant knowledge gaps still exist regarding the taxonomic diversity, biogeographic distribution, and nutritional characterisation of these resources, and this represents a significant limit to their effective conservation and valorisation. The present research displays the first comprehensive checklist of the WEPs of the Mediterranean, produced through the combination of large international datasets and extensive literature review. The list includes supraspecific *taxa*, accepted species names and authors, species origin and geographic information (when available), conservation status both *in situ* (*sensu* IUCN) and *ex situ* (data from BGCI PlantSearch). The subsequent analysis will provide taxonomic treatment and statistics, highlighting plant groups richest in edible species as well as phylogenetic coverage. Finally, both taxonomic and geographical gaps will be identified. Results will constitute the first steppingstone towards the complete appreciation of a neglected and yet critical resource for the sustainable development of future food systems. The revitalisation of Mediterranean WEPs could represent an effective solution to present challenges, by fostering diet diversification and climate adaptation.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Elenco delle piante selvatiche commestibili del Mediterraneo: comprendere la diversità di una risorsa trascurata

Gori B.[1,2,3,4]*, *Porceddu M.*[1,3,4], *Ulian T.*[2], *Bacchetta G.*[1,3,4]

[1]Università degli Studi di Cagliari (Sardinia, Italy)
[2]Royal Botanic Gardens, Kew. (London, United Kingdom)
[3]Centre for Biodiversity Conservation (CCB)
[4]Sardinian Germplasm Bank (BG-SAR)

*Corresponding author: benedetta.gori@unica.it

I sistemi alimentari tradizionali Mediterranei sono stati storicamente caratterizzati dalla pratica di raccogliere e consumare piante selvatiche commestibili (PSC). Tuttavia, negli ultimi decenni, importanti trasformazioni socioeconomiche hanno portato al progressivo abbandono di tale usanza, ed al crescente deterioramento degli habitat naturali che ospitano le specie. Oggi esistono ancora grandi lacune di conoscenza riguardo alla diversità tassonomica, alla distribuzione biogeografica, ed alla caratterizzazione nutrizionale di queste risorse, e ciò rappresenta una forte limitazione alla loro conservazione e valorizzazione. Il presente lavoro presenta il primo elenco completo delle PSC del Mediterraneo, prodotto attraverso la combinazione di grandi dataset internazionali ed una sistematica revisione della letteratura esistente. L'elenco include taxa sovraspecifici e relativi nomi scientifici e autori accettati, origine geografica delle specie, informazioni sulla distribuzione (se disponibili), e stato di conservazione sia in situ (sensu IUCN) che ex situ (dati ottenuti da BGCI PlantSearch). La successiva analisi statistica evidenzierà i gruppi vegetali più ricchi di specie commestibili, così come le principali lacune di informazione a livello tassonomico e geografico. I risultati costituiranno il primo passo verso l'esaustiva conoscenza di una risorsa trascurata e al tempo stesso critica per lo sviluppo sostenibile dei nostri futuri sistemi alimentari. La valorizzazione delle PSC Mediterranee potrebbe infatti rappresentare una soluzione efficace a molte delle grandi sfide che stiamo affrontando, favorendo la diversificazione della dieta e l'adattamento climatico.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

An update of the floristic knowledge of Dino Island (Calabria, S-Italy)

Musarella C.M.[1], Caruso G.[1], Fascetti S.[2], Laface V.L.A.[1], Mazzuca S.[3], Patti M.[1], Piro A.[3], Potenza G.[5], Puntillo D.[6], Ravo M.[7], Rosati L.[2], Spampinato G.[1], Torre A.[8], Stinca A.[8]*

[1] Department of Agriculture, Mediterranean University of Reggio Calabria, Reggio Calabria, Italy
[2] Scuola di Scienze Agrarie, Forestali, Alimentari e Ambientali, Università della Basilicata, Potenza, Italy
[3] Department of Chemistry and Chemical Technologies Università della Calabria, Rende (Cosenza), Italy
[5] Herbarium Lucanum, University of Basilicata, Potenza, Italy (external collaborator)
[6] Museo di Storia Naturale della Calabria ed Orto Botanico. Università della Calabria, Rende (Cosenza), Italy
[7] Genomix4Life Srl, Via Allende 43/L, 84081 Baronissi (Salerno), Italy
[8] Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania "Luigi Vanvitelli", Caserta, Italy

*Corresponding author: carmelo.musarella@unirc.it

Dino Island is an islet of approx. 40 hectares located in front of the city of Praia a Mare in Calabria (southern Italy), along the north-western coast of the Tyrrhenian Sea. To date there are very few scientific contributions on this island (Longo 1902, La Valva and Ricciardi 1976-77, Giaccone et al. 1994). To verify what the current floristic consistency of the island is about fifty years after the last more complete study, the Campania-Lucana-Calabrese regional section of the Italian Botanical Society has planned a series of field trips that will concern all the environments of the island. Longo (1902) reported 104 taxa for this territory, while La Valva and Ricciardi (1976-77) reported 295 including the Longo's records, although some have not been confirmed by themTo date, three field trips have been carried out in the months of March, April and May 2023, both in terrestrial and marine environments. Several samples were collected and stored in the herbariums of the excursion participants. The nomenclature is according to PORTALE DELLA FLORA D'ITALIA 2022.2 (for flora), Nimis (2023) (for lichens), Giaccone (1994) (for algae). To date, 157 taxa have been collected and/or observed by the authors for Dino Island, two of which are aquatic (*Posidonia oceanica* and *Cymodocea nodosa*). Therefore, considering the previous reports by Longo and La Valva & Ricciardi, to date a total of 313 taxa have been reported for Dino Island. Among them, the following are new to the island: *Daphne gnidium*, *Athamanta ramosissima*, *Saxifraga tridactylites*, *Spiranthes spiralis*, *Geranium rotundifolium*, *Iris germanica*, *Oxalis pes-caprae*, *Phyllirea angustifolia*, *Kalanchoë ×houghtonii* and others. Moreover, some taxa previously reported as cultivated, were now found as spontaneous: *Nerium oleander*, *Pinus pinea* and *P. halepensis*. To the aforementioned floristic records, we can add also 53 lichens, 3 of which are present in the Italian Red List: *Cerothallia luteoalba*, *Coenogonium luteum* and *Dirina ceratoniae*. Furthermore, *Entherographa crassa* and *Cerothallia luteoalba* are probably extinct in northern Italy. Finally, we report 8 algae, 1 of which (*Dictyota dichotoma*) is new with respect to the floristic survey by Giaccone et al. (1994).
There are still other field trips to complete this floristic update study on this very particular Italian islet which will allow us to enhance its peculiar terrestrial and marine plant biodiversity.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Un aggiornamento delle conoscenze floristiche dell'isola di Dino (Calabria, S-Italia)

Musarella C.M.[1], Caruso G.[1], Fascetti S.[2], Laface V.L.A.[1], Mazzuca S.[3], Patti M.[1], Piro A.[3], Potenza G.[5], Puntillo D.[6], Ravo M.[7], Rosati L.[2], Spampinato G.[1], Torre A.[8], Stinca A.[8]*

[1] Department of Agriculture, Mediterranean University of Reggio Calabria, Reggio Calabria, Italy
[2] Scuola di Scienze Agrarie, Forestali, Alimentari e Ambientali, Università della Basilicata, Potenza, Italy
[3] Department of Chemistry and Chemical Technologies Università della Calabria, Rende (Cosenza), Italy
[5] Herbarium Lucanum, University of Basilicata, Potenza, Italy (external collaborator)
[6] Museo di Storia Naturale della Calabria ed Orto Botanico. Università della Calabria, Rende (Cosenza), Italy
[7] Genomix4Life Srl, Via Allende 43/L, 84081 Baronissi (Salerno), Italy
[8] Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania "Luigi Vanvitelli", Caserta, Italy

*Corresponding author: carmelo.musarella@unirc.it

L'Isola di Dino è un isolotto di ca. 40 ettari situata di fronte alla città di Praia a Mare in Calabria (sud Italia), lungo la costa nord-occidentale del Mar Tirreno. Ad oggi sono pochissimi i contributi scientifici su quest'isola (Longo 1902, La Valva e Ricciardi 1976-77, Giaccone et al. 1994). Per verificare quale sia l'attuale consistenza floristica dell'isola a circa cinquant'anni dall'ultimo studio più completo, la sezione regionale campano-lucana-calabrese della Società Botanica Italiana ha programmato una serie di escursioni sul campo che copriranno tutti gli ambienti dell'isola. Longo (1902) ha riportato 104 taxa per questo territorio, mentre La Valva e Ricciardi (1976-77) ne hanno segnalati 295 includendo le segnalazioni di Longo, anche se alcune non sono state da loro confermate. Ad oggi sono state effettuate tre escursioni nei mesi di marzo, aprile e maggio 2023, sia in ambiente terrestre che marino. Diversi campioni sono stati raccolti e conservati negli erbari dei partecipanti all'escursione. La nomenclatura è secondo PORTALE DELLA FLORA D'ITALIA 2022.2 (per la flora), Nimis (2023) (per i licheni), Giaccone (1994) (per le alghe). Ad oggi sono stati raccolti e/o osservati dagli autori 157 taxa per l'Isola di DIno, due dei quali acquatici (*Posidonia oceanica* e *Cymodocea nodosa*). Pertanto, considerando le precedenti segnalazioni di Longo e La Valva & Ricciardi, ad oggi sono stati segnalati per questa isola un totale di 313 taxa. Tra questi, i seguenti sono nuovi: *Daphne gnidium, Athamanta ramosissima, Saxifraga tridactylites, Spiranthes spiralis, Geranium rotundifolium, Iris germanica, Oxalis pes-caprae, Phyllirea angustifolia, Kalanchoë ×houghtonii* e altri. Inoltre, alcuni taxa precedentemente segnalati come coltivati, sono stati ora rinvenuti come spontanei: *Nerium oleander, Pinus pinea* e *P. halepensis*. Alle suddette segnalazioni floristiche si aggiungono anche 53 licheni, di cui 3 presenti nella Lista Rossa italiana: *Cerothallia luteoalba, Coenogonium luteum* e *Dirina ceratoniae*. Inoltre, *Entherographa crassa* e *Cerothallia luteoalba* sono probabilmente estinte nell'Italia settentrionale. Infine, riportiamo 8 alghe, di cui 1 (*Dictyota dichotoma*) è nuova rispetto all'indagine floristica di Giaccone et al. (1994).
Ci sono da fare ancora altre uscite sul campo per completare questo studio di aggiornamento floristico su questo particolarissimo isolotto italiano che ci permetterà di valorizzare la sua peculiare biodiversità vegetale terrestre e marina.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Education, awareness and sustainability as tools to mitigate the effects of climate change

Cano-Ortiz A. [1]*, *García Yelo B.A.* [1], *García García E.* [1]

[1] *Department of Didactics of Experimental, Social and Mathematical Sciences. Complutense University of Madrid, Faculty of Education, Rector Royo Villanova s/n, Ciudad Universitaria, 28040 Spain;*

*Corresponding author: acano07@ucm.es

The profound social transformation is worrying due to its high speed of change, which in most cases is counterproductive to progress in mitigating climate change. For this reason, we propose three pillars to avoid the continuation of climate change, "educate, raise awareness and provoke a sustainable socioeconomic development"; in the first case it is about educating in environmental values, for this it is essential to implement knowledge about pollution in schools, such implementation should be done by updating environmental content in the educational curricula. Awareness-raising is intended to achieve respect for the environment around us, which requires the rational use of natural resources, which can be achieved through knowledge and appreciation of these resources, and it is the educational centers and the media that should be involved in this process. It is known that a picture is worth a thousand words, so it is the television media that should deepen this idea, programs such as Agrosfera, Aquí la Tierra and other environmental programs should be promoted, increasing this type of programs to raise awareness among the population. If these general guidelines are established, it is very possible to obtain sustainable socioeconomic development, for which it is essential, among other actions, to practice regenerative agriculture and livestock farming, since its implementation can mitigate climate change. Regenerative agriculture must provide the absence of polluting pesticides, and information on these polluting agents must be provided at an educational and communicative level; to this end, emphasis must be placed on the value of agricultural vegetation covers as CO_2 sinks. As for regenerative or rotational livestock farming, it allows the rational use of pasture, being necessary to value pastures as CO_2 sinks, so it is necessary to conserve pastures, which can be achieved through a rotational grazing system, and of course with livestock load studies, and always establishing a relationship between type of livestock and type of pasture, since not all types of pasture are suitable for all types of livestock. As an example, we can mention plant communities with a certain biomass, such as *Hordeum leporinum, Taeniatherum caput-medusae, Avena sterilis, Avena barbata, Medicago polimorpha, Trifolium sp.* etc., are very appropriate for cattle and horses; however, sparse pastures with low biomass such as *Trifolium subterraneum*, *Poa bulbosa* are only appropriate for sheep.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Educación, concienciación y sostenibilidad como herramientas para paliar los efectos del cambio climático

Cano-Ortiz A.[1]*, *García Yelo B.A.*[1], *García García E.*[1]

[1] *Department of Didactics of Experimental, Social and Mathematical Sciences. Complutense University of Madrid, Faculty of Education, Rector Royo Villanova s/n, Ciudad Universitaria, 28040 Spain;*

*Corresponding author: acano07@ucm.es

La profunda transformación social es preocupante debido a su elevada velocidad de cambio, que en la mayoría de las ocasiones es contraproducente para avanzar en la forma de mitigar el cambio climático. Por esta razón propones tres pilares que eviten la continuación de dicho cambio climático, "educar, concienciar y provocar un desarrollo socioeconómico sostenible"; en el primero de los casos se trata de educar en valores ambientales, para ello es esencial implementar el conocimiento sobre contaminación en las escuelas, dicha implementación deberá hacerse mediante la actualización de contenidos ambientales en los currículos educativos. Con la concienciación se pretende conseguir el respeto por el entorno que nos rodea, para lo que es preciso el uso racional de los recursos naturales, lo que se puede conseguir mediante el conocimiento y la valoración de estos recursos, debiendo ser los centros educativos y medios de comunicación los implicados en este proceso. Se sabe que una imagen vale más que mil palabras, por ello son los medios televisivos los que deben profundizar en esta idea, programas como Agrosfera, Aquí la Tierra y otros programas ambientales deben ser potenciados, incrementándose este tipo de programas para obtener la concienciación de la población. Si se marcasen estas directrices generales es muy posible obtener un desarrollo socioeconómico sostenible, para ello es fundamental, entre otras acciones, practicar una agricultura y ganadería regenerativa, ya que con su implantación se puede paliar el cambio climático. En una agricultura regenerativa debe proveer la ausencia de fitosanitarios contaminantes, debiendo darse información de estos agentes contaminantes a nivel educativo y comunicativo; para ello hay que poner énfasis en el valor de las cubiertas vegetales agrícolas como sumideros de CO_2. En cuanto a la ganadería regenerativa o ganadería rotativa, permite el uso racional del pastizal, siendo necesario poner en valor los pastos como sumideros de CO_2, por lo que es preciso la conservación de los pastizales, lo que puede conseguirse mediante un sistema de pastoreo rotatorio, y por supuesto con estudios de carga ganadera, y estableciendo siempre una relación tipo de ganado-tipo de pasto, ya que no todo tipo de pasto sirve para todo tipo de ganado. Como ejemplo podemos mencionar las comunidades vegetales de cierta biomasa, como las de *Hordeum leporinum, Taeniatherum caput-medusae*, *Avena sterilis*, *Avena barbata*, *Medicago polimorpha*, *Trifolium sp*. etc, son muy apropiadas para una ganadería vacuna y caballar; sin embargo, aquellos pastos ralos de escasa biomasa como los de *Trifolium subterraneum, Poa bulbosa* solo son apropiados para ovejas.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Fossil sites as didactic resources in the teaching of ecology: intra- and interspecific relationships

García Yelo B.A. [1]*, *García García E.* [1], *Cano-Ortiz A.* [1], *Oliver Pérez A.* [2,3]

[1] Department of Didactics of Experimental, Social and Mathematical Sciences. Complutense University of Madrid, Faculty of Education, Rector Royo Villanova s/n, Ciudad Universitaria, 28040 Spain.
[2]Asociación Mujeres con los pies en la Tierra. Calle José Antonio Novais 12, 28040, Madrid, Spain.
[3]Departamento de Paleobiología, Museo Nacional de Ciencias Naturales, MNCN-CSIC, Calle José Gutiérrez Abascal 2, 28006 Madrid, Spain.

*Corresponding author: bgyelo@ucm.es

This paper explores the usefulness of paleontological sites as a didactic resource, eminently practical, for teaching and developing educational competences in Ecology. During the 2022-2023 academic year, training activities were carried out, linked to two field trips to the Somosaguas paleontological site (Middle Miocene, 14 million years old; Madrid, Spain), with students enrolled in Fundamentals and Didactics of Biology course (Primary Education Teacher) from the Faculty of Education - CFP of the Complutense University of Madrid. Prior to the development of the field trips, and by means of a questionnaire, the students' initial knowledge of intra- and interspecific relationships established between the members of an ecosystem was evaluated. Subsequently, during these visits, the students participated in a series of training activities (gamification and role-play) focused on working, among other things, on contents related to the inter- and intraspecific relationships established between the members of past ecosystems prevailing in the Community of Madrid. Subsequently, the students' knowledge of specific ecology contents was evaluated again, and an improvement in their knowledge of biotic relationships was observed after the visit, demonstrating, therefore, the didactic potential of paleontological sites for teaching subjects not directly related to paleontology. After carrying out these activities, the students manifested a higher motivation towards, not only the specific ecological content, which facilitated the acquisition of the notions worked, but also other concepts previously unknown to them.
It is important to mention that the activities developed, aimed at primary school pupils, can be easily implemented by preservice teacher during the subsequent development of their activity. Moreover, this type of action, in addition to its potential to generate an eco-social awareness, values natural heritage, presenting itself as a versatile resource that allows teaching, not only ecological concepts, but also others related to many other areas of experimental sciences, technology, engineering, arts and mathematics (STEAM), bringing together many of the skills that future teachers should acquire at the end of their training period.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Los yacimientos paleontológicos como recurso didáctico en la enseñanza de la ecología: las relaciones intra e interespecíficas

García Yelo B.A. [1]*, *García García E.* [1], *Cano-Ortiz A.* [1], *Oliver Pérez A.* [2,3]

[1] Department of Didactics of Experimental, Social and Mathematical Sciences. Complutense University of Madrid, Faculty of Education, Rector Royo Villanova s/n, Ciudad Universitaria, 28040 Spain.
[2]Asociación Mujeres con los pies en la Tierra. Calle José Antonio Novais 12, 28040, Madrid, Spain.
[3]Departamento de Paleobiología, Museo Nacional de Ciencias Naturales, MNCN-CSIC, Calle José Gutiérrez Abascal 2, 28006 Madrid, Spain.

*Corresponding author: bgyelo@ucm.es

El presente trabajo explora la utilidad de los yacimientos paleontológicos como recurso didáctico, eminentemente práctico, para trabajar contenidos y competencias en Ecología. Durante el curso 2022-2023 se realizaron acciones formativas, vinculadas a dos visitas al yacimiento paleontológico de Somosaguas (Mioceno Medio, 14 millones de años; Madrid, España), con alumnado de la asignatura de Fundamentos y Didáctica de la Biología (Maestro en Ed. Primaria) de la Facultad de Educación - CFP de la Universidad Complutense de Madrid. Previamente al desarrollo de las salidas, y mediante el uso de un formulario, se evaluó el conocimiento inicial del alumnado respecto a las relaciones intra e interespecíficas establecidas entre los integrantes de un ecosistema. Posteriormente y, durante la realización de estas visitas, el alumnado participó en una serie de actividades formativas (gamificación y juego de roles) centradas en trabajar, entre otros, contenidos relativos a las relaciones inter e intraespecíficas que se establecen entre los integrantes del ecosistema imperante en la Comunidad de Madrid en el pasado. Posteriormente, se evaluó nuevamente el conocimiento del alumnado en contenidos específicos de ecología, observándose una mejora en los conocimientos sobre relaciones bióticas tras la realización de la visita, demostrando, por tanto, la utilidad didáctica de los yacimientos paleontológicos para trabajar contenidos no directamente relacionados con la Paleontología. Tras la realización de estas actividades, el alumnado manifestó cómo habían encontrado especialmente motivadoras las actividades realizadas en el yacimiento, lo que facilitó la adquisición de las nociones trabajadas, así como de otros conceptos previamente desconocidos para el mismo.
Es importante señalar que las actividades desarrolladas, dirigidas a alumnado de educación primaria, son fácilmente implementables por los y las estudiantes de Magisterio durante el posterior desarrollo de su actividad. Además, este tipo de acciones, a parte de su potencial como generador de una conciencia ecosocial, ponen en valor el patrimonio natural, presentándose como un recurso versátil que permite enseñar, además de conceptos relacionados con la ecología, otros relacionados con muchas otras áreas de las ciencias experimentales, matemáticas, tecnológicas y artísticas (STEAM), reuniendo gran parte de las competencias que los futuros formadores deben adquirir al finalizar su periodo formativo.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Vegetation Heritage Value in EIA context: the case study of Quinta do Carmo, Portugal

Batista T.[1], Peixeiro V., Pinto Gomes C.[1,2,3], Meireles C.[2,3]*

[1]University of Évora – MED Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute; School of Science and Technology, Évora, Portugal.
[2]University of Évora – MED Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute; Portugal, Évora.
[3]University of Évora, School of Science and Technology, Portugal, Évora.

*Corresponding author: mtfb@uevora.pt

The importance of vegetation can be expressed by its heritage value. Several types of values can be attributed to landscapes, depending on the scientific approach. Heritage value is one of these types. Vegetation is one of the most important factors, which conditions the value of landscape heritage and should be evaluated not only *per se*, but also as a habitat for many wild animal species.
The heritage value of vegetation must, thus, be considered as a key factor in selecting the most interesting areas for nature conservation and vegetation in particular. The concept of Vegetation Heritage Value (VHV) is based on the evaluation of several structural and functional criteria: horizontal and vertical structure of the vegetation patches; importance as habitat; tree cover density; rare species richness; phytocoenosis maturity, importance as ecological corridor, historical record, scientific, educational and recreational potential.
In this communication we will present the fundamental base of the VHV and its application in Environmental Impact Assessment studies.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Valor do Património Vegetal em contexto da AIA: o caso de estudo da Quinta do Carmo, Portugal

Batista T.[1], Peixeiro V., Pinto Gomes C.[1,2,3], Meireles C.[2,3]*

[1]University of Évora – MED Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute; School of Science and Technology, Évora, Portugal.
[2]University of Évora – MED Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute; Portugal, Évora.
[3]University of Évora, School of Science and Technology, Portugal, Évora.

*Corresponding author: mtfb@uevora.pt

A importância da vegetação pode ser expressa pelo seu valor patrimonial. Vários tipos de valores podem ser atribuídos às paisagens, dependendo da abordagem científica. O valor patrimonial é um desses tipos. A vegetação é um dos fatores mais importantes, que condiciona o valor do património paisagístico e deve ser avaliada não só per se, mas também como habitat para muitas espécies de animais silvestres. O valor patrimonial da vegetação deve, assim, ser considerado como um fator chave na seleção das áreas mais interessantes para a conservação da natureza e da vegetação em particular. O conceito de Valor Patrimonial da Vegetação (VHV) assenta na avaliação de vários critérios estruturais e funcionais: estrutura horizontal e vertical das manchas de vegetação; importância como habitat; densidade da cobertura arbórea; riqueza de espécies raras; maturidade da fitocenose, importância como corredor ecológico, registro histórico, potencial científico, educacional e recreativo.Nesta comunicação apresentaremos a base fundamental do VHV e sua aplicação em estudos de Avaliação de Impacto Ambiental.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Cedrus atlantica biodiversity in the Aures in relation to the industrial effluents of a BaSO4 chemical pollutant and impacts on chlorophylls

Hezil W.[1,2], Taferghoust M.[1,2], Yaacoub H.[2], Yasmina D. [3]*

[1]Laboratory of wetlands conservation, University 8 Mai 1945, Guelma, Algeria
[2]Faculty of Natural Sciences and Life, Abbes LaghrourUniversity. Algeria
[3]Higher National School of Forests, Khenchela Algeria

*Corresponding author hezil.wissem@univ-guelma.dz

Cedrus atlantica is one of the most threatened species in North Africa by human activity in the natural environment. Conifer biodiversity plays an important role in maintaining the structure and functioning of ecosystems by investigating the chlorophyll parameter. We chose to study the impact of a source of pollution on the biochemical response of this endemic species, namely the barium processing factory (SOMIBAR). The technique used for the extraction of chlorophylls is that of Agrawal *et al*., 1986. At the Ouled Yacoub cedar forest near the processing factory, the total chlorophyll content of cedar is in the order of 22,75 ± 0,52 µg/g MF; while at the Chélia mountain cedar forest, where the stations are far from the barium factory, the levels are in the order of 23.79 ± 2.48 µg/g MF. Chlorophyll concentrations are close to those expressed by controls, resulting in negligible variation in levels. Through the two cedars, more than half of the trees are affected by the decline, with about 51% of the trees in Chélia Mountain and 47 % of those of Ouled Yacoub Mountains. These results could show that the distance in this case plays no role limiting, because barium is a very high-density ore (d=4.5), so its mobility is difficult. Air pollution and climate warming remain the most important cause involved on a large scale in the degradation of the essential pigment and the main receptor of photosynthesis thus causing considerable trees decline and decrease of conifers biodiversity, located near industries.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Biodiversité de *Cedrus atlantica* dans les Aurès par les effluents industriels d'un polluants chimique $BaSO_4$ et impacts sur la chlorophylle

Hezil W.[1,2]*, *Taferghoust M.*[1,2], *Yaacoub H.*[2], *Yasmina D.* [3]

[1]*Laboratory of wetlands conservation, University 8 Mai 1945, Guelma, Algeria*
[2]*Faculty of Natural Sciences and Life, Abbes LaghrourUniversity. Algeria*
[3]*Higher National School of Forests, Khenchela Algeria*

*Corresponding author hezil.wissem@univ-guelma.dz

Cedrus atlantica est une espèce des plus menacées par le dépérissement en Afrique du nord, parl'activité anthropiquesur le milieu naturel. La biodiversité des conifères joue un rôle important dans le maintien de la structure et du fonctionnement des écosystèmes, par l'investigation du paramètre chlorophylle. Nous avons choisi d'étudier l'impact d'une source de pollution sur la réponse biochimique de cette espèce endémique, à savoir l'usine de transformation de la barytine (SOMIBAR). La technique utilisée pour l'extraction des chlorophylles est celle de Agrawal *et al*., 1986. Au niveau de la cédraie d'Ouled Yacoub, près de l'usine de transformation de la baryte, les teneurs en chlorophylle totale du cèdre sont de l'ordre de 22,75±0,52 µg/g MF ; alors qu'au niveau de la cédraie de Chélia, où les stations sont loin de l'usine, les teneurs sont de l'ordre de 23,79±2,48 µg/g MF. Les concentrations des chlorophylles se rapprochent de celles exprimées par les témoins, ce qui se traduit par une variation négligeable des teneurs. A travers les deux cédraies, plus de la moitié des arbres est touchée par le dépérissement, avec environ 51 % des arbres de la montagne Chélia et 47 % de ceux du massif d'Ouled Yacoub. Ces résultats pourraient suggérer que la distance dans ce cas ne joue aucun rôle limitant, car le baryum est un minerai d'une densité très élevée (d=4,5), sa mobilité est donc difficile voire impossible. La pollution de l'air et l'élevation de la température restent parmi les causes les plus prononcées contribuant à grande échelle dans la dégradation du pigment essentiel et le principal récepteur de la photosynthèse provocant ainsi un dépérissement considérable et un déclin de la biodiversité des conifères situés à proximité des industries.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

The use of an insecticide alternative of plant origin based on the fruits and leaves of Melia azedarach to fight against the processionary caterpillar of the Atlas cedar

Taferghoust M., Bouchama K., Chelih R.*

Department of ecology & environment, natural and life sciences Faculty, Khenchela University 40000, Algeria

*Corresponding author: taferghoustmeriem@gmail.com

The potential of plants with insecticidal and insect- repellent properties made it possible to present the prospects for the development of new phytosanitary compounds of plant origin and their place in integrated biological control. In this context, this study aims to propose alternative solutions based on the of plant extracts as «bioinsecticide», in order to fight against the processionary caterpillar considered as a serious threat for the conifers.

To meet this objective, we are trying to evaluate the toxicity of an ethanolic extract at different doses of *Melia azedarach* on the Atlas cedar processionary caterpillar or *Thaumetopea bonjeani* in order to use it as a biopesticide. The ethanolic extraction was carried out according to the method of Upson and Coll. (1999). An acute toxicity test was carried out in the laboratory by exposing a batch of larvae (stage 4) to different doses, three doses were chosen (100, 500 et 1000 ppm), for each treatment, the dead caterpillars are counted after 12, 24, 48 hours, the methodology was inspired by the technique of susceptibility testing standardized by the world health organization. Focusing on the lethal effect and anti-appetizing effect, our study showed a larvicidal effect of the ethanolic of the leaves and fruits of *Melia azedarach.* Compared to the control batch (treated with distilled water), the results obtained after 48 h revealed a high mortality rate in all batches treated with (100, 500 et 1000 ppm) where significant differences were recorded by analysing the results for the dunette test. However, the two low doses (100 et 500 ppm) seem harmless after 12 h treatment and only lethal after 48h pour 100 ppm et 24h for 500ppm. As for the anti-appétant effect and the weight loss in the larvae, nonsignificant differences were recorded compared to the control group after 12, 24 et 48h of treatment. The lethal activity in our results is probably due to the presence of active molecules with insecticidal or larvicidal effect, this preliminary evaluation of the larvicidal activity showed that the ethanolic extract of *Melia azedarach* can offer a promising alternative for the reduction of use phytosanitary products of chemical origin.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

L'utilisation d'une alternative insecticide d'origine végétale à base de fruits et feuilles du Melia azedarach pour lutter contre la chenille processionnaire du cèdre de l'Atlas

Taferghoust M., Bouchama K., Chelih R.*

Department of ecology & environment, natural and life sciences Faculty, Khenchela University 40000, Algeria

*Corresponding author: taferghoustmeriem@gmail.com

Le potentiel des plantes à vertus insecticides et ou insectifuges a permis de présenter les perspectives de développement de nouveaux composés phytosanitaires d'origine végétale et de leur place dans la lutte biologique et intégrée.
Dans ce contexte cette étude a pour objectif de proposer des solutions alternatives basées sur l'utilisation des extraits végétaux comme «bioinsecticide», afin de lutter contre la chenille processionnaire considérée comme une menace sérieuse pour les conifères.
Pour répondre à cet objectif, nous essayons d'évaluer la toxicité d'un extrait éthanolique à différentes doses de Melia azedarach sur la chenille processionnaire du cèdre d'atlas ou *Thaumetopea bonjeani* en vue de l'utiliser comme un biopesticide. L'extraction éthanolïque a été effectuée selon la méthode d'Upson et Coll. (1999). Un test de toxicité aiguë a été réalisé en laboratoire en exposant un lot de larve (stade L4) à différentes doses, trois doses ont été choisies (100, 500 et 1000 ppm), pour chaque traitement on procède à un comptage des chenilles mortes après 12, 24, 48 heures, la méthodologie a été inspirée de la technique des tests de sensibilité normalisés par l'organisation mondiale de la santé. Focalisant sur l'effet létal et l'effet anti-appétant notre étude a mis en évidence un effet larvicide de l'extrait éthanolïque des feuilles de Melia azedarach. Comparativement au lot témoin (traité par de l'eau distillée) les résultats obtenus après 48 h ont révélé un taux de mortalité élevé dans tous les lots traités (100, 500 et 1000 ppm) où des différences significatives ont été enregistrées en analysant les résultats par le test de dunette. Cependant, les deux faibles doses (100 et 500 ppm) semblent inoffensives après 12 h de traitement et seulement létal après 48h pour 100 ppm et 24h pour 500ppm. Quant à l'effet anti-appétant et la perte du poids chez les laves, des différences non significatives ont été enregistrés comparativement au lot témoin après 12, 24 et 48h de traitement. L'activité létale dans nos résultats est probablement due à la présence de molécules actives à effet insecticide ou larvicide, cette évaluation préliminaire de l'activité larvicide a montré que l'extrait éthanolique de Melia azedarach peut proposer une alternative prometteur pour la réduction de l'utilisation des produits phytosanitaires d'origine chimique.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Freshwater macroalgae in Sicily: an undiscovered biodiversity

*Pagana I. *, Di Stefano M., Emma G., Cristaudo A., Alongi G.*

Department of Biological, Geological and Environmental Sciences – University of Catania, Italy- Via Empedocle, 58

*Corresponding author: ilaria.pagana@phd.unict.it

Lentic (marshes, lakes, ponds) and lotic (rivers, streams, rapids) water habitats are important biodiversity hotspots. Sicily is rich in these environments, strongly threatened by anthropic activities and climate change. These threats affect the animals and plants communities that inhabit there and the ecosystem services connected to them. The macroalgal component of terrestrial aquatic ecosystems is poorly studied in Sicily, despite its important role in maintaining the ecological balance of these fragile habitats. To cover this gap in knowledge, from 2021, exploration campaigns were carried out to identify suitable sites for studying the macroalgae that characterize fresh and brackish water habitats of Eastern Sicily. The species sampled were identified at the laboratories of the Department of Biological, Geological, and Environmental Sciences - Plant Biology Section of the University of Catania. In this contribution, we report preliminary data on the families *Lemaneaceae* (Rhodophyta), for lotic water and Characeae (Chlorophyta), for lentic water. Two species of *Lemaneaceae* of high biogeographical interest have been found: *Paralemanea catenata* (Kützing) Vis & Sheath, reported in Italy only for Aspromonte (Calabria) by Mannino et al. (2003), and *Lemanea fucina* Bory actually reported for Croatia, Estonia, Finland, France, Germany, Spain, Sweden and the United Kingdom (Vis & Necchi, 2021). *Characeae* have been studied for Western Sicily, while few researches were conducted for wetlands of Eastern Sicily. We identified taxa belonging to the genera *Chara* Linnaeus*, Nitella* C. Agardh, and *Tolypella* (A. Braun) A. Braun, filling this knowledge gap and redefining their distribution at regional level. This work complements the current knowledge on macroalgal biodiversity and provides the bases to better understand the ecological dynamics of these habitats and improve their conservation and management strategies.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Macroalghe di zone umide della Sicilia orientale: una biodiversità ancora da scoprire

Pagana I., Di Stefano M., Emma G., Cristaudo A., Alongi G.*

Department of Biological, Geological and Environmental Sciences – University of Catania, Italy- Via Empedocle, 58

*Corresponding author: ilaria.pagana@phd.unict.it

Gli habitat di acque lentiche (pantani, laghi, pozze) e lotiche (fiumi, torrenti, ruscelli, rapide) costituiscono importanti hotspot di biodiversità. La Sicilia è ricca di questi ambienti che, purtroppo, sono fortemente minacciati sia dalle attività antropiche che dai cambiamenti climatici. Tali minacce mettono a rischio le comunità animali e vegetali che li abitano e i servizi ecosistemici ad essi connessi. La componente macroalgale degli ecosistemi acquatici terrestri, nonostante svolga un ruolo importante nel mantenimento dell'equilibrio ecologico di questi delicati habitat, risulta ad oggi poco studiata per il territorio siciliano. Per colmare questa lacuna conoscitiva, a partire dal 2021, sono state avviate delle campagne esplorative per individuare i siti idonei allo studio delle macroalghe che caratterizzano gli habitat di acque dolci e salmastre della Sicilia orientale. Le specie campionate sono state identificate presso i laboratori del Dipartimento di Scienze Biologiche, Geologiche e Ambientali – sezione di Biologia Vegetale, dell'Università degli Studi di Catania. In questo contributo riportiamo i dati preliminari su specie delle famiglie *Lemaneaceae* (Rhodophyta), per le acque lotiche, e *Characeae* (Chlorophyta), per le acque lentiche. Per quanto riguarda la famiglia delle *Lemaneaceae*, sono state rinvenute due specie di particolare interesse biogeografico: *Paralemanea catenata* (Kützing) Vis & Sheath, segnalata in Italia solo per l'Aspromonte (Calabria) da Mannino et al. (2003), e *Lemanea fucina* Bory riportata ad oggi per Croazia, Estonia, Finlandia, Francia, Germania, Spagna, Svezia e Regno Unito (Vis & Necchi, 2021). La famiglia delle *Characeae* è stata indagata principalmente per il settore occidentale della Sicilia e poche sono le ricerche relative alle zone umide della Sicilia orientale. Il nostro studio ha permesso di identificare taxa appartenenti ai generi *Chara* Linnaeus*, Nitella* C. Agardh e *Tolypella* (A. Braun) A. Braun e a meglio definire la loro distribuzione a livello regionale. Questo studio arricchisce le conoscenze sulla biodiversità algale e pone le basi per comprendere meglio le dinamiche ecologiche di questi habitat e migliorarne le strategie di conservazione e gestione.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Bryophyte flora of the Valle del Bove (Mt. Etna, E Sicily)

Bacilliere G., Puglisi M.*

Department of Biological, Geological and Environmental Sciences, University of Catania

*Corresponding author: giulia.bacilliere@gmail.com

Located within a peculiar environmental context, occupying a privileged position in the center of the Mediterranean, the volcano Etna is a naturalistic site of great scientific interest. Its geological history and geographical position, the diversity of its eruptive phenomena, the nature of its environment contribute to conferring an exceptional naturalistic value.
The Valle del Bove is one of the most characteristic parts of the Etna, desert and impressive; it is the remnant of a large collapsed caldera which currently receives the lavas from the cacuminal eruptive cones and which are channeled along the eastern slope. It is a vast natural amphitheater with a characteristic "horseshoe" shape which represents one of the most fascinating and wild natural environments of Etna. Currently the valley is mostly covered by layers of recent lava and therefore devoid of vegetation. Only on the highest spikes and along the edges of the valley it is possible to find plant formations including several endemic species.
The bryological investigations carried out so far on Etna had never included this particular environment. For this reason, in recent years some field investigations were carried out with the aim of providing information also on the bryophytic component of the flora. The bryophytes were found only on magmatic dykes, which are ancient ribbon-like magmatic intrusions that rise perpendicular to the ground. They are represented only by mosses with an acrocarpic habitus; this data appears entirely justifiable if we consider the type of environment investigated, as well as the climatic characteristics of the study area. The taxa found belong to the families *Grimmiaceae, Mniaceae, Pottiaceae, Polytrichaceae, Bryaceae*, and *Orthotrichaceae* and, as concerns the ecological characteristics, are mostly acidophytic, xerophytic and cryophytic. Some of them are boreal montane or boreo-arctic montane specie, showing a great interest from a phytogeographical point of view. These taxa, with disjointed distribution in the Northern hemisphere, probably migrated to Italy during the Pleistocene glaciations, colonizing vast areas of the Alps and moving south along the Apennines up to the mountains of Sicily and, in particular, the Mt. Etna, which represents the southern limit of their distribution area in Italy. These species probably survived on the Sicilian mountains in refuge stations and, therefore, can be considered as glacial relicts of the Sicilian bryophyte flora.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

La flora briofitica della Valle del Bove (Etna, Sicilia orientale)

Bacilliere G., Puglisi M.*

Department of Biological, Geological and Environmental Sciences, University of Catania

*Corresponding author: giulia.bacilliere@gmail.com

Posizionata in un contesto ambientale peculiare, in posizione privilegiata al centro del Mediterraneo, l'Etna rappresenta un sito di grande interesse scientifico. La sua storia geologica e la posizione geografica, la diversità dei suoi fenomeni eruttivi, la natura del suo ambiente contribuiscono a conferirle un eccezionale valore naturalistico.
La Valle del Bove è uno dei tratti più caratteristici dell'Etna, desertica e suggestiva; è il residuo di un'ampia caldera collassata che attualmente riceve le lave dai coni eruttivi cacuminali che si incanalano lungo il versante orientale. Si tratta di un vasto anfiteatro naturale dalla caratteristica forma a "ferro di cavallo" che rappresenta uno degli ambienti naturali più affascinanti e selvaggi dell'Etna. Attualmente la Valle è in gran parte ricoperta da strati di lava recente e quindi priva di vegetazione. Solo sulle cime più alte e lungo i bordi della Valle è possibile trovare formazioni vegetali con diverse specie endemiche.
Le indagini briologiche finora condotte sull'Etna non avevano mai incluso questo particolare ambiente. Per tale motivo, negli ultimi anni sono state effettuate alcune indagini di campo con l'obiettivo di fornire informazioni anche sulla componente briofita della flora. Le briofite sinora raccolte sono state trovate solo sui dicchi magmatici, antiche intrusioni magmatiche nastriformi che si innalzano perpendicolarmente al suolo. Si tratta esclusivamente di muschi ad habitus acrocarpico; tale dato appare del tutto giustificabile se si considera il tipo di ambiente indagato, nonché le caratteristiche climatiche dell'area di studio. Le specie rinvenute appartengono alle famiglie Grimmiaceae, Mniaceae, Pottiaceae, Polytrichaceae, Bryaceae e *Orthotrichaceae* e, per quanto riguarda le caratteristiche ecologiche, sono per lo più acidofitiche, xerofitiche e criofitiche. Alcune di esse sono specie boreali montane o boreo-artiche montane, di grande interesse dal punto di vista fitogeografico. Questi taxa, a distribuzione disgiunta nell'emisfero settentrionale, probabilmente migrarono in Italia durante le glaciazioni pleistoceniche, colonizzando vaste aree delle Alpi e spostandosi a sud lungo l'Appennino fino alle montagne della Sicilia e, in particolare, all'Etna, che rappresenta limite meridionale del loro areale in Italia. Queste specie sono probabilmente sopravvissute sui monti siciliani in stazioni di rifugio e, pertanto, possono essere considerate relitti glaciali della flora briofita siciliana.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Invasiveness of *Salpichroa origanifolia* (Lam.) Baillon in the forest of San Rossore (UNESCO Biosphere Reserve 'Selve Costiere di Toscana')

Arduini I., Alessandrini V.*

Dipartimento Scienze Agrarie, Alimentari e Agroambientali, Università di Pisa, Via del Borghetto, 80, I-56124 Pisa, Italy.

*Corresponding author: iduna.arduini@unipi.it

Salpichroa origanifolia (Lam.) Baillon is a perennial herb of the *Solanaceae* family, native to the temperate regions of South America, where it grows from 0 to 2500 m asl, frequently behaving as a ruderal species.
The introduction pathways were, probably, both unintentional, through the trade of seed and potted plants containing propagules, or intentional, as ornamental, or melliferous plant. The species is now naturalized in Europe, USA, Australia, and New Zealand. Its introduction is forbidden in Australia and Japan, while in Europe it is not listed as an invasive alien species of EU concern, and it is not included in any of the EPPO lists. Though reports from European countries are scarce, *S. origanifolia* was found to spread rapidly in southern Switzerland, and in the Canary Islands. In Italy, it is present in most regions, and recently its status was changed from naturalized to invasive in Campania and Calabria (Laface et al., 2020).
The first report for Tuscany dates back to 1923 (Chiarugi), but around 2000, the species was still considered rare (Pedullà and Garbari 2004). More recently, *S. origanifolia* was frequently recorded in the urban and rural sites of the coastal provinces, and around Florence.
We studied the spread of *S. origanifolia* in the nature reserve of San Rossore, which is part of a 23,000ha wide forest system extending along the Tuscan coast from Viareggio to Livorno (UNESCO Reserve of Biosphere "Selve Costiere di Toscana"). The species was not recorded in San Rossore before 2000 (Garbari, 2000), though there is an anonymous herbarium specimen dated 1996. In 2010, *S. origanifolia* was accidentally found in cut stone pine plantations (Orlandi and Arduini, 2010) and a single plant was observed near the buildings at the reserve entrance. Ten years later, *S. origanifolia* showed a clear invasive habit, forming dense stands under isolated trees at the edges of the forest, and inside the forest, especially in correspondence of fallen trees. Phenological and morphological traits contributed to the invasiveness of this species. Shoots grew from March to December, and the flowering period was very long, from June to October. Plants spread rapidly producing both scrambling and rooting aerial stems, and two types of hypogeal stems: fine fleshy stolons (3-4 mm) just below the soil surface, and up to 7-mm-thick deep growing woody rhizomes. The recent invasion in San Rossore was probably also favored by forest dieback and by wild boars, which scavenged hypogeal stems during winter, thus increasing their fragmentation and diffusion.
Preliminary findings highlight three key points:
1. *Salpichroa origanifolia* resembles a rhizome-geophytic Liana, rather than a suffruticose Chamaephyte (Ellenberg and Müller-Dombois, 1965);
2. Alien species can become invasive long after their introduction;
3. Potential invasiveness could be inferred from distribution patterns and ecological amplitude in the native range.
Ongoing controlled condition experiments are investigating the resistance of *S. origanifolia* propagules to low temperatures and drought, and their competitiveness towards native forest species, by analyzing the plantlets emerging from the soil seed bank in the presence or absence of hypogeal propagules.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Invasività di *Salpichroa origanifolia* (Lam.) Baillon nel bosco di San Rossore (UNESCO Riserva della Biosfera 'Selve Costiere di Toscana')

Arduini I., Alessandrini V.*

Dipartimento Scienze Agrarie, Alimentari e Agroambientali, Università di Pisa, Via del Borghetto, 80, I-56124 Pisa, Italy.

*Corresponding author: iduna.arduini@unipi.it

Salpichroa origanifolia (Lam.) Baillon (*Solanaceae*), è una specie erbacea perenne originaria delle regioni temperate dell'America meridionale, dove cresce tra 0 e 2500 m slm, frequentemente in ambienti ruderali.
L'introduzione è avvenuta, probabilmente, accidentalmente, attraverso il commercio di sementi e piante rinvasate contenenti propaguli, e intenzionalmente, come specie ornamentale o mellifera. Oggi, la specie è naturalizzata in Europa, USA, Australia e Nuova Zelanda. La sua introduzione è vietata in Australia e Giappone, mentre in Europa non è inclusa tra le specie aliene invasive di interesse comunitario e non è annoverata nelle liste EPPO.
Tra le poche informazioni note per l'Europa, una rapida diffusione di *S. origanifolia* è stata segnalata nella Svizzera meridionale e nelle Isole Canarie. In Italia, è presente nella maggior parte delle regioni e, recentemente, il suo status è stato modificato da naturalizzata ad invasiva in Campania e Calabria (Laface et al., 2020).
La prima segnalazione in Toscana risale al 1923 (Chiarugi), ma intorno al 2000, la specie era ancora ritenuta rara (Pedullà and Garbari 2004). Recentemente, vi sono numerose segnalazioni per le aree urbane e rurali delle province costiere e di Firenze.
Abbiamo studiato la diffusione di *S. origanifolia* nella riserva naturale di San Rossore, che fa parte di un sistema forestale esteso per 23.000 ettari lungo la costa toscana tra Viareggio e Livorno. La specie non era segnalata in San Rossore prima del 2000 (Garbari, 2000), sebbene un campione di erbario anonimo riporti la data 1996.
Nel 2010, *S. origanifolia* è segnalata come casuale nelle pinete tagliate di pino domestico (Orlandi and Arduini, 2010) e un individuo isolato è stato rinvenuto intorno agli edifici all'ingresso della riserva. Dieci anni dopo *S. origanifolia* mostra un evidente comportamento invasivo, formando coperture compatte sotto alcuni alberi isolati al margine del bosco e anche al suo interno, in corrispondenza degli alberi caduti.
L'invasività di questa specie è favorita sia da caratteristiche fenologiche che morfologiche. La stagione vegetativa va da marzo a dicembre e anche la fioritura è prolungata, da giugno a ottobre. Le piante si propagano rapidamente mediante fusti lianosi e radicanti, unitamente a due tipi di fusti ipogei: stoloni carnosi sottili (3-4 mm) decorrenti appena sotto la superficie e rizomi lignificati più spessi (7 mm) e profondi. La recente invasione è favorita anche dalla diffusa moria di alberi e dall'elevata presenza di cinghiali che, scavando gli stoloni carnosi in inverno, ne favoriscono la frammentazione.
Questi risultati preliminari evidenziano tre aspetti:
1. *Salpichroa origanifolia* è più conforme ad una Liana geofita-rizomatosa che ad una Camefita suffruticosa (Ellenberg and Müller-Dombois, 1965).
2. Le specie aliene possono divenire invasive anche molto tempo dopo l'introduzione. 3. Il potenziale invasivo di una specie può essere desunto dall'habitat e dall'ampiezza ecologica nell'areale di origine.
Sono in corso esperimenti in condizioni controllate per studiare: i) la resistenza dei frammenti di fusto epigei ed ipogei alle basse temperature e all'aridità, e ii) la competitività di *S. origanifolia* nei confronti delle specie del sottobosco, mediante l'analisi dell'emergenza dalla banca semi del suolo forestale contenente o meno i propaguli.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Remote sensing reveals fire-driven facilitation of a C4 rhizomatous alien grass on a small Mediterranean volcanic island

Guarino R.[1], Cerra D.[2], Zaia R.[3], Chiarucci A.[4], Lo Cascio P.[5], Rocchini D.[4], Zannini P.[4], Pasta S.[6]*

[1]Department of Biological, Chemical and Pharmaceutical Sciences and Technologies (STEBICEF), University of Palermo, 90123 Palermo, Italy
[2]Remote Sensing Technology Institute (IMF), German Aerospace Center DLR, 82234 Oberpfaffenhofen, Germany
[3]Magmatrek, 98050 Stromboli (ME), Italy
[4]BIOME Lab, Department of Biological, Geological and Environmental Sciences, Alma Mater Studiorum, University of Bologna, 40126 Bologna, Italy
[5]NESOS, 98055 Lipari (ME), Italy
[6]Institute of Biosciences and BioResources (IBBR), National Research Council, 90129 Palermo, Italy

*Corresponding author: riccardo.guarino@unipa.it

Volcanic islands are special ecosystems for studying biogeographical and evolutionary processes. Occasional disturbance events, such as eruptions, tsunami or big fires, can represent major drivers of such processes leading to biotic sterilisation or major changes in island biotas. In this study, through remotely sensed data, we investigated the intensity and the extent of a large fire event that occurred on the small volcanic island of Stromboli (Aeolian archipelago, Italy) on 25-26 May 2022, to assess the short-term effect of fire damages on local plant communities. For this purpose, two different spectrally sensitive indices, i. e. the differential Normalised Burned Index (dNBR) and the Normalised Difference Vegetation Index (NDVI), were used. The dNBR was also used to quantify the extent of early-stage vegetation recovery, dominated by *Saccharum biflorum* Forssk. (Poaceae), a rhizomatous C4 perennial grass of paleotropical origin. The burned area was estimated to have an extension of around 337.83 ha, corresponding to 27.7% of the island surface and to 49.8% of Stromboli's vegetated area. On the one hand, this event considerably damaged the native plant communities, hosting many species of high biogeographic interest. On the other hand, *Saccharum biflorum* clearly benefited from arson. In fact, it showed a very high vegetative performance after burning, being able to exert unchallenged dominance in the early stages of the post-fire succession, reaching within a few months stem density values that are only slightly lower than those of the unburned stands. Our results confirm the complex and probably synergic impact of different human disturbances (recurrent fires, introduction of invasive alien plants) on the structure and the functioning of natural ecosystems on small volcanic islands.

XV INTERNATIONAL SEMINAR
BIODIVERSITY MANAGEMENT AND CONSERVATION
"Plant ecology and conservation in the Mediterranean area"
Linguaglossa (Sicily), ITALY / June 6th – 10th 2023

Il telerilevamento rivela la facilitazione, mediata dagli incendi, di un'erba aliena rizomatosa C4 su una piccola isola vulcanica del Mediterraneo

Guarino R.[1], Cerra D.[2], Zaia R.[3], Chiarucci A.[4], Lo Cascio P.[5], Rocchini D.[4], Zannini P.[4], Pasta S.[6]*

[1]Department of Biological, Chemical and Pharmaceutical Sciences and Technologies (STEBICEF), University of Palermo, 90123 Palermo, Italy
[2]Remote Sensing Technology Institute (IMF), German Aerospace Center DLR, 82234 Oberpfaffenhofen, Germany
[3]Magmatrek, 98050 Stromboli (ME), Italy
[4]BIOME Lab, Department of Biological, Geological and Environmental Sciences, Alma Mater Studiorum, University of Bologna, 40126 Bologna, Italy
[5]NESOS, 98055 Lipari (ME), Italy
[6]Institute of Biosciences and BioResources (IBBR), National Research Council, 90129 Palermo, Italy

*Corresponding author: riccardo.guarino@unipa.it

Le isole vulcaniche rappresentano ecosistemi ideali per lo studio dei processi biogeografici ed evolutivi. Eventi di disturbo occasionali, come eruzioni, tsunami o grandi incendi, possono rappresentare i principali motori di tali processi, che possono portare alla sterilizzazione biotica o a grandi cambiamenti ambientali. In questo studio, attraverso dati telerilevati, abbiamo analizzato l'intensità e l'estensione di un incendio verificatosi sulla piccola isola vulcanica di Stromboli (arcipelago delle Eolie, Italia) il 25-26 maggio 2022, per valutare l'effetto a breve termine dei danni da incendio sulle comunità vegetali locali. A tal fine, sono stati utilizzati due diversi indici, ovvero il differential Normalised Burned Index (dNBR) e il Normalised Difference Vegetation Index (NDVI). Il dNBR è stato utilizzato anche per valutare la ripresa della vegetazione nelle prime fasi post-incendio, dominate da *Saccharum biflorum* Forssk. (Poaceae), una graminacea C4 perenne rizomatosa di origine paleotropicale. L'area bruciata è stata pari a 337,83 ettari, corrispondente al 27,7% della superficie dell'isola e al 49,8% della superficie vegetata di Stromboli. Da un lato, questo evento ha danneggiato notevolmente le comunità vegetali autoctone, che ospitano molte specie di elevato interesse biogeografico. D'altro canto, *Saccharum biflorum* ha chiaramente tratto beneficio dall'incendio doloso. Infatti, ha dimostrato una ripresa vegetativa molto elevata dopo l'incendio, riuscendo a dominare incontrastato nelle prime fasi della successione post-incendio, raggiungendo in pochi mesi valori di densità dei fusti solo leggermente inferiori a quelli dei popolamenti non bruciati. I nostri risultati confermano l'impatto complesso e probabilmente sinergico di diversi disturbi antropici (incendi ricorrenti, introduzione di piante esotiche invasive) sulla struttura e sul funzionamento degli ecosistemi naturali sulle piccole isole vulcaniche.