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Società Italiana di Scienza della Vegetazione

58th INTERNATIONAL CONGRESS
ITALIAN SOCIETY OF VEGETATION SCIENCE
Società Italiana Scienza della Vegetazione (SISV)

Vegetation Ecology and Diversity for Habitat Monitoring and Conservation

June 19th – 21, 2025
Mediterranean University of Reggio Calabria
Via dell'Università 25, Reggio Calabria, Italy

BOOK OF ABSTRACTS




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Book of abstracts and Field trip guide

June 19th – 20th, 2025
Mediterranean University of Reggio Calabria, Via dell'Università 25, Reggio Calabria, Italy
June 21st, 2025
Field trip to "Aspromonte National Park"

Book of abstracts: Oral communications, Posters communication and Field trip guide

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Cover photo: Giovanni Spampinato – Aspromonte National Park (Reggio Calabria, Southern Italy)
From top left to bottom right:
Piano delle Valli, peat bog - habitat 7240;
Dolomiti di Canolo, cliffs - habitat 8210;
Fiumara di Melito, glareicolous vegetation with *Helichrysum italicum* – habitat 3250;
Background: Tre Limiti, mixed forests of *Fagus sylvatica* and *Abies alba* – habitat 9220*.

Congress logo designed and created: by Valentina Lucia Astrid Laface. In the illustration: Demetra (*Quercus petraea* (Matt.) Liebl. subsp. *austrotyrrhenica* Brullo, Guarino & Siracusa), the oldest dated sessile oak ("wiggle matching" radiocarbon age 934 ± 65 years) in the world.

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June 20th 2025

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19.30	**Tour of Reggio Calabria city** by convertible tourist bus. Audioguide in: IT, EN, FR, DE, ES. Duration: 45 min.

June 21st, 2025

Field trip to the "Aspromonte National Park": Tre Limiti and the Menta Dam.

07:30	Meeting of participants at Piazza Indipendenza, Reggio Calabria (https://maps.app.goo.gl/EiTJx36f7DUvk1e8A)
08:00	Departure
13:00	Packed Lunch*
17:00	Expected return to Reggio Calabria at the same place of departure and/or railway station and/or airport of Reggio Calabria

*The lunch is included in the registration fee.

ORAL COMMUNICATIONS

IDENTIFYING PRIORITY HABITATS FOR RESTORATION IN THE SOUTH OF PORTUGAL

Quinto Canas R.[1], Xarepe D.[1], Cano-Ortiz A.[2], Pinto Gomes C.[3]

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[3]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)
Presenting author: Ricardo Quinto Canas, rjcanas@ualg.pt

Keywords: Algarve, Habitats Directive, species of conservation priority, vascular plant communities, vegetation science

The Algarve region comprises the thermophilous territories of the southernmost unit of mainland Portugal, representing one of the most important areas for the conservation of flora and plant communities. In this area, where the Special Areas of Conservation designated under the Natura 2000 network cover 36% of the terrestrial territory, which hosts 54 habitats legally protected under the Habitats Directive, 92/43/EEC (HD), and 198 plant species with high conservation priority [1].

Habitats are very important natural places that must be continuously monitored to preserve them and their inhabitants, especially the endemic species that characterize them. In fact, several habitats in the Algarve region are threatened by different types of pressures linked to anthropogenic-induced changes, including those generated by climate change. As a result, biodiversity loss has continued to occur at a worrying rate over recent decades, partly due to the undevelopment of specific actions for nature conservation and biodiversity and the absence of an operational monitoring system.

Based on our relevés (and past works taken from literature), the cross-reference with the Annex I habitat types of the HD (ALFA 2004) [2] and the species of conservation priority (based on national and international protection catalogues) [3], we developed a reference framework to define priorities in terms of knowledge to be acquired concerning nature restoration and conservation and its planning/programming, for proper regional coordination between all sectors with responsibilities in this field.

1) Quinto Canas R., Raposo M., Cano-Ortiz A., Musarella C.M., Xarepe D., Pinto Gomes C., 2023. *Priority habitats and checklist of the vascular plant communities of Algarve (Portugal)*. Pp. 59-60. In: Giusso del Galdo G., Sciandrello S., Cristaudo A., Minissale P., Puglisi M., Ranno V., Tavilla G. (Eds.). XV International Seminar Biodiversity Management and Conservation. Plant ecology and conservation in the Mediterranean area". Book of abstracts. Linguaglossa - Etna, Sicily /Italy), University of Catania Sicily, Italy.

2) ALFA, 2004. *Tipos de Habitat Naturais e Seminaturais do Anexo I da Diretiva 92/43/CEE (Portugal continental): Fichas de Caracterização Ecológica e de Gestão para o Plano Setorial da Rede Natura 2000*, Associação Lusitana de Fitossociologia.

3) Carapeto A., Francisco A., Pereira P., Porto M. (eds.) 2020. *Lista Vermelha da Flora Vascular de Portugal Continental*, Lisboa: Sociedade Portuguesa de Botânica, Associação Portuguesa de Ciência da Vegetação – PHYTOS e Instituto da Conservação da Natureza e das Florestas.

MONITORING LONG-TERM CHANGES IN ITALIAN COASTAL DUNE VEGETATION: INSIGHTS FROM THE RESURVEYDUNES INITIATIVE

Acosta A.T.R., Allevato E., Angiolini C., Bagella S., Bazan G., Bertacchi A., Brancaleoni L., Buffa G., Del Vecchio S., Di Biase L., Calbi M., Caria M.C., Ciccarelli D., Cutini M., de Francesco M.C., De Natale A., Fantinato E., Fiaschi T., Gangale C., Gerdol R., Gianguzzi L., Laface V.L.A., Maccherini S., Morabito A., Mugnai M., Musarella C.M., Pafumi E., Santangelo A., Sarmati S., Sciandrello S., Siccardi E., Spampinato G., Stanisci A., Strumia S., Viciani D.

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Keywords: coastal dune ecosystems, ecosystem restoration, endangered habitats, historical vegetation plot resurvey, long-term changes, vegetation science.

Coastal dunes are unique transition zones between land and sea, supporting specialized flora and fauna adapted to harsh environmental conditions. These ecosystems exhibit a distinct plant community zonation, creating a mosaic of habitats that contributes to their remarkable biodiversity. Despite their high conservation value, Mediterranean coastal dunes have undergone significant alterations, ranking among the most threatened ecosystems in Europe. Given the current pressures, monitoring long-term vegetation dynamics has become an urgent priority. Resurveying studies offer a cost-effective approach to detecting temporal vegetation changes, particularly in highly dynamic and frequently disturbed environments like coastal dunes. Here we introduce the first results from a collaborative network of Italian vegetation scientists engaged in resurveying coastal dune habitats to track long term temporal changes. As part of this initiative, we have begun compiling ReSurveyDunes [1], the first database of resurveyed coastal dune vegetation in Italy, integrating historical phytosociological data revisited in 2023–2024. The database now includes over 1050 vegetation plots across 11 Italian regions, with historical records dating back to 1974. It focuses primarily on herbaceous psammophilous coastal habitats, specifically those classified under the EU Habitats Directive (1210, 2110, 2120, 2130*, 2210, and 2230). Preliminary analyses provide a comprehensive overview of the diversity of Italian coastal dune habitats and reveal major temporal trends at both the community and species levels. Direct comparisons between historical and recent data indicate notable shifts, particularly in pioneer habitats. Our findings highlight an overall decline in typical and diagnostic species, alongside an increase in ruderal and non-native species, demonstrating how shifts in species composition within these habitats represent a tangible threat to their conservation. Finally, we identify key knowledge gaps and propose directions for future research. Moving forward, we aim to deepen our understanding of Mediterranean coastal dune dynamics, generating critical insights to support conservation and restoration efforts.

1) Acosta A.T.R., Di Biase L., Sarmati S., Allevato E., Angiolini C., Bagella S., Bazan G., Bertacchi A., Brancaleoni L., Buffa G., Calbi M., Caria M.C., Ciccarelli D., Cutini M., de Francesco M.C., De Natale A., Fantinato E., Fiaschi T., Gangale C., Gerdol R., Gianguzzi L., Laface V.L.A., Maccherini S., Morabito A., Mugnai M., Musarella C.M., Pafumi E., Santangelo A., Sciandrello S., Siccardi E., Spampinato G., Stanisci A., Strumia S., Viciani D., Del Vecchio S. 2025. ReSurveyDunes — a data resource of resurveyed coastal dune vegetation plots in Italy. Vegetation Ecology and Diversity 62: 1-6. https://doi.org/10.3897/ved.1395392).

ISSUES RELATED TO THE MONITORING OF PRIORITY HABITAT 6220* IN SARDINIA

Caria M.C.[1,3], Cuccuru S.[1], Denaro A.[1], Farris E.[1,2,3], Maccioni A.[1,2], Maxia F.[4], Orrù G.[5], Pisanu S. [1], Rivieccio G.[1], Serra S.[5], Bagella S.[1,2,3]

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Presenting author: Maria Carmela Caria, mccaria@uniss.it

Keywords: conservation measures, Habitat Directive, habitat monitoring, vegetation.

The Habitat 6220* — *"Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea"* — is a priority habitat under Annex I of the EU Habitats Directive (92/43/EEC), characterized by species-rich herbaceous communities typical of traditional low-intensity agricultural systems in Mediterranean regions [1].

This Habitat is very complex and variegated, and it includes different subtypes depending on the vegetation characteristics and the management. The Interpretation Manual of EU Habitats in Italy attributes this Habitat to three classes that are very different from each other: *Thero-Brachypodietea*, *Lygeo-Stipetea* and *Poetea bulbosae* [2]. Nevertheless, it is poorly characterized and requires a deep syntaxonomic revision [3].

The high complexity hinders accurately identifying and interpreting this Habitat and assessing its distribution and conservation status.

Therefore, the Region of Sardinia has entered into a two-year agreement with the University of Sassari to obtain a comprehensive overview of the Habitat within the Natura 2000 Network aimed to update the Standard Data Form, the habitat cartography, the evaluation of the conservation status, the pressures/threats and all the parameters mandatory under the art. 17 of the Habitat Directive.

During the monitoring, each polygon assigned to habitat 6220*, also in mosaic with other habitats, was explored to verify the presence habitat and assess the requested parameters. Vegetation surveys were performed using the phytosociological method, according to Angelini et al. [4].

Over 200 vegetation surveys were collected during the first monitoring campaign 2024, carried out across 24 of the 46 assigned SACs. During the field activities, we encountered several issues related to the position of habitat patches, often unreachable due to the morphology of the terrain or because they are located within private properties and to the interpretation of the mosaics. Other issues were related to the assignment of some vegetation types to the Habitat.

The results highlight knowledge gaps, propose an updated Habitat distribution map, and suggest surveying methods aimed at proper monitoring.

1) European Commission, 2013. Interpretation Manual of European Union Habitats EUR 28, DG-ENV, Luxemburg, 146 pp.
2) Biondi E., et al., 2009. Manuale Italiano di interpretazione degli habitat della Direttiva 92/43/CEE. Società Botanica Italiana. Ministero dell'Ambiente e della tutela del territorio e del mare, D.P.N. http://vnr.unipg.it/habitat/
3) Fois M., et al., 2021. Proposals for improvement of Annex I of Directive 92/43/EEC: Sardinia. Plant Sociology 58(2): 65–76.
4) Angelini P., et al. (ed.), 2016. Manuali per il monitoraggio di specie e habitat di interesse comunitario (Direttiva 92/43/CEE) in Italia: habitat. ISPRA, Serie Manuali e linee guida, 142/2016.

VEGETATION OF TRAVERTINES: PHYTOSOCIOLOGY, HABITATS MAPPING AND ENVIRONMENTAL QUALITY IN THE ACQUE ALBULE AREA (CENTRAL ITALY)

Di Pietro R.[1,9], Aleffi M. [2], Azzella M.M[1], Carli E.[3] Giardini M.[4], Fortini P.[5,9], Iamonico D.[6] Proietti E.[1], Ravera S.[7], Tondi G.[8]

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Keywords: Alysso-Sedion, Habitat Directive, Landscape Conservation, Life forms, Syntaxonomy

The Acque Albule plain, on the Tyrrhenian side of the Lazio Region, is the largest travertine basin in Italy. The peculiar lithological and geomorphological characteristics of this area give rise to a very interesting vegetation pattern, which includes four habitats listed in the Interpretation Manual 92/43/EU, namely 6110* "Rupicolous calcareous or basophilic grasslands of the *Alysso-Sedion albi*", 6220* "Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea*"; 7210* "Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*" and 7220* "Petrifying springs with tufa formation (*Cratoneurion*)". A significant part of this area is currently included in a Special Area of Conservation (IT6030033). A recent floristic analysis [1] identified several taxa of high biogeographical importance for both vascular plants and bryophytes.

In this study, 280 phytosociological relevés were carried out using the Braun-Blanquet phytosociological approach [2]. The cluster analysis and the PCA highlighted numerous plant communities that were well distinguishable from each-other, which can be summarised as follows: *Alysso-Sedion albi* therophytic and chamaephytic communities of the travertine outcrops dominated by *Sedum hispanicum* and *Petrosedum rupestre* respectively; *Stipo-Trachynietea* annual grasslands; micro-garrigues with *Onosma angustifolia* and *Thymus acicularis*; dry grasslands with *Bromopsis erecta* and *Chrysopogon gryllus*; sub-mesophylus grasslands on clayey substrates with *Thynopyrum acutum*; mesophilous communities dominated by *Poa pratensis* and *Lolium apenninum*; *Molinio-Arrhenatheretea* and *Phragmito-Magnocaricetea* vegetation mosaics surrounding water pools; *Pistacia terebinthus* and *Phillyrea latifolia* shrublands. In addition, several types of sub-nitrophilous and synanthropic communities were found, alternately dominated by *Trigonella esculenta, Dasypyrym villosum, Artemisia vulgaris, Tordylium apulum*.

The application of the Landscape Conservation Index [3] has highlighted a negative feedback on the vegetation associated with heavy human disturbance. The exploitation of water resources through travertine quarries and thermal or bathing facilities is causing a significant lowering of the water table threatening the survival of some of the EU habitats mentioned above.

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2) Braun-Blanquet J (1964) Pflanzensoziologie. Grundzüge der Vegetationskunde. Springer Verlag.

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MISALIGNED INTERPRETATION OF NATURA 2000 SITES IN ITALY: REASSESSING HABITAT 5220* AND 5330

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Keywords: Habitat Directive, Mediterranean maquis, Periploca angustifolia, Ziziphus *scrub*

During the work on the Fifth Report on the Habitats listed in Annex I of Directive 92/43/EEC in Italy, concerning Macro-category V (Sclerophyllous scrubs), significant discrepancies emerged between the data presented in the Standard Data Forms (SDFs) of Natura 2000 sites and the information provided in the habitat mapping for 5220* (Arborescent matorral with *Ziziphus*) and 5330 (Thermo-Mediterranean and pre-desert scrub). These inconsistencies stem from differing interpretations of the related phytocoenotic types, which are not always consistently represented across the national territory. In particular, for habitat 5220* the "Italian interpretation Manual" includes vegetation dominated by *Periploca angustifolia*, as it is phytosociologically classified under the same alliance (*Periplocion angustifoliae*) to which the *Ziziphus* scrub belongs (Order *Pistacio-Rhamnetalia alaterni*, Class *Quercetea ilicis*). This contrasts with the "European interpretation Manual," which assigns *P. angustifolia* scrub to habitat 5330, identifying it as a subtype of Corine biotopes 32.25 – Mediterranean pre-desert scrub. Based on the Italian Manual, the vegetation dominated by *P. angustifolia,* which is fairly widespread on the small islands of the Sicily Channel (Egadi, Pelagie, and Pantelleria), has been attributed to habitat 5220* in the Management Plans and Standard Data Forms of the respective Natura 2000 sites. However, the habitat mapping used for the Reports, following the Italian Manual's stricter criteria, classifies this vegetation under habitat 5330, thus showing habitat 5220* as absent from these islands. To resolve these inconsistencies and avoid further confusion, we believe it is both appropriate and necessary to revise the definition of habitat 5220* in the Italian Manual [1], reassigning *P. angustifolia* scrub to habitat 5330. This would restore a more restrictive interpretation aligned with the European Manual and Corine Land Cover references. Accordingly, habitat 5220* should be reserved for summer-deciduous *Ziziphus lotus* scrub (present in some Natura 2000 sites in southern and western Sicily) and other similar types within the *Periplocion angustifoliae* alliance, such as remnant scrub with *Rhus tripartita*, found in specific locations in southern Sicily and on Linosa Island.

Additional discrepancies have been noted for habitat 5330, whose name (Thermo-Mediterranean and pre-desert scrub) and description in the manuals clearly refer to the broader category of Mediterranean scrub (maquis s.l.). However, the interpretation used in the SDFs and Report maps sometimes takes an overly selective approach, including only the subtypes explicitly listed in Corine biotopes (e.g., 32.22 Tree-spurge formations, 32.23 Diss-dominated garrigues, 32.24 Palmetto brush, 32.25 Pre-desert scrub, 32.26 Thermo-Mediterranean broom fields), and excluding others. This has led to the omission of classic macchia types, such as *Oleo-Lentiscetum* s.l. associations or highly localized nuclei with *Celtis tournefortii* subsp. *aetnensis*, from Standard Data Forms (e.g., sites in Calabria, Elba Island, etc.) and to the "deactivation" of the corresponding mapping cells. In our view, this is a mistake, given the ecological value of these formations, which are often sub-climactic, rare, and declining, and of high naturalistic and environmental importance.

1) Biondi E. et al. 2009. Manuale Italiano di Interpretazione degli habitat della Direttiva 92/43/CEE. SBI, MATTM, DPN. (http://vnr.unipg.it/habitat/index.jsp).

HABITAT TYPE REPORTING UNDER ARTICLE 17 OF THE HABITATS DIRECTIVE: THE ITALIAN APPROACH FOR THE 2019–2024 CYCLE

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Keywords:biodiversity, distribution maps, habitat conservation, monitoring, VegItaly

The V Annex I habitats reporting cycle, covering the period 2019 to 2024, is being prepared. The institutional referent for this process, on behalf of the Italian Ministry of the Environment and Energy Security (MASE), is the Italian Institute for Environmental Protection and Research (ISPRA). The scientific support is given by the University of Sassari (UNISS) and the Italian Society of Vegetation Science (SISV). A working group of thematic and regional experts is analyzing and validating the data on habitat areas, pressures, threats, and conservation measures provided by the Italian Regions and Autonomous Provinces to ISPRA. The data have been organized in a database developed by ISPRA according to the EU reporting format. Based on the European grid ETRS89-LAEA5210 with a 10x10 km² mesh, national habitat distribution maps have been collected in a dedicated WebGIS system, facilitating access, compilation, and management.
However, this process has encountered various challenges. A broad scientific discussion to find methodologically robust solutions to address the difficulties due to data gaps and inconsistencies in the analysis is ongoing. The process aims to ensure the traceability of the information and to facilitate the collection of scientific articles, phytosociological surveys, and unpublished specialist material, thereby creating a substantial pool of data that will support a long-term approach for future reporting cycles. Moreover, the data are being cross-checked with additional sources, including the Natura 2000 database, released by MASE in December 2024.
The preliminary findings offer initial insights into the conservation status of 124 types of terrestrial and inland water habitats in Italy, assessed across the Alpine, Continental and Mediterranean biogeographic regions.
Cartographic outcomes, associated databases, and additional data used for the assessments will be made available online on the official website created by ISPRA, once the European Commission has completed the validation process. Furthermore, a freely accessible online archive of phytosociological surveys, representative of the various Annex I habitats in Italy, is being established within the national "VegItaly" database, owned by SISV. This long-term vision, focused on storing and enhancing knowledge, represents a significant step forward in building an effective monitoring system for preserving Annex I habitats in Italy.

AMPELODESMOS MAURITANICUS GRASSLANDS, A MISUNDERSTOOD HABITAT (6220 VS 5330 CODE OF ANNEX I DIR. 92/43/EEC)

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Keywords: Lygeo-Stipetea*, Mediterranean grasslands, Natura 2000 network*

Ampelodesmos mauritanicus (Poir.) T. Durand & Schinz is an herbaceous plant belonging to the Poaceae family, which plays an important role in the Mediterranean plant landscape, particularly in the southernmost regions of the western Mediterranean [1]. It can form extensive fire-prone grasslands, which are aspects of the degradation of the original forest or scrub cover, as well as many tall grasslands that fall into the class *Lygeo Stipetea* [1].

In Annex I of the Habitat Directive, the vegetation with *Ampelodesmos mauritanicus* is referred to the habitat 5330, placed together with shrubby vegetation types where the species may be present, but generally with low cover values. Based on a case study from Sicily that examined these grasslands and their floristic composition throughout the island [2], we made a statistical processing of about 100 relevés compared with 100 others, available in [4,5], of the same vegetation series, but characterized by shrubby species, referable to the habitat 5330. The study aimed to highlight the incorrect attribution of the habitat and propose framing these grasslands in habitat 6220*similarly to other grasslands of the *Lygeo-Stipetea* class.

The accurate attribution of this habitat type is crucial for reviewing the information in the standard data forms of the Natura 2000 protected areas network.

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32 YEARS OF INTEGRATED HABITAT MONITORING AT THE HIGH-MOUNTAIN STATION OF VELINO-DUCHESSA LTER SITE

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Keywords: alpine vegetation, microclimate, soil profile, Velino-Duchessa

Changes in vegetation have been recorded over the last 32 years in the high-mountain plant communities of the Monte di Sevice research station, belonging to the "Appennino Centrale: Velino-Duchessa" LTER site (https://deims.org/12c79ecb-7890-4b75-9655-0883dacd8a29). Systematic sampling was carried out in two high-mountain plant communities, alpine tundra *(Saxifrago speciosae-Silenetum cenisiae,* habitat 8240*) and snow-bed grassland *(Trifolio thalii-Festucetum microphyllae,* habitat 6230*) ranging from 2100-2200 m a.s.l.

Preliminary results on the recorded time changes were published in 2005 [1] and 2021 [2], based on species occurrence and their relative coverage, life forms and strategies. While aboveground plant functional traits have been sufficiently investigated, the belowground plant life has remained almost completely unexplored until now. On the basis of 32 years of ecological research (phytosociological releves systematically collected in 20 years, from 1993 to 2024, and microclimate measurements recorded in the same site over 12 years, starting in 2014), a first attempt was carried out in 2023 to interpret time changes through the root traits (measured in the field) of the most sensitive and locally invasive species [3]. However, for both communities, the first soil characterization was not performed until 2024.

The soil profile and chemical analysis carried out in 2024 confirm that, together with the aboveground component, the belowground component of the biocenosis is also negatively affected by the increased frequency and duration of frost periods, connected to the increased discontinuity of snow coverage in winter and to the different soil types of the two communities (shallow and basic the former, deep and acidic the latter).

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NEGLECTED HABITATS OF SAC IT 3210012: VAL GALINA E PROGNO BORAGO

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Keywords: habitat classification, habitat monitoring, vegetation science

The SAC Val Galina Progno Borago (IT3210012) is located in a hilly area very close to the city of Verona (Northern Italy). The biodiversity of the SAC is representative of the great variability of the landscape, where forests, rock walls and grasslands compete with vineyards. The variable topography of these hills, with different slopes and exposure, allows the coexistence of plant communities with very different ecology just a few hundred meters away from each other.

While a lot of historical and recent floristic data are available [1-5] the knowledge of the vegetation has been unappreciated, with only a single monograph, dating back to the 90s [2]. An extensive data collection survey based on phytosociological approach started in 2022. More than 100 phytosociological relevés together with an updating of the Natura 2000 habitat map, according to the regional regulation (DGR Veneto n. 1066 del 17.04.2007), were used to produce a comprehensive georeferenced geodatabase, using QGIS Bratislava 3.40 [6].

The main results were:

1) A decreasing of 37% of the area of the grasslands referred to the habitat 6210*.
2) A decreasing of 5% of the area of the habitat 9260.
3) The identification of habitats not included in the updated standard data form, such as the meadows of the habitat 6510 and the oak forest (probably habitat 91H0*).
4) The exclusion of the habitat 5130, whose presence was hypothesized by Latella et al. [7].
5) The definition of the main pressures and threats to all the habitats (according to the DGR Veneto n. 2299 del 09.12.2014).
6) The conservation status assessment of structure and functions of each habitat type.
7) The identification of interesting plant communities not considered as habitat types in Annex I of Habitats Directive but well represented in the SAC.

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TRADE-OFFS IN PLANT ECOLOGICAL STRATEGIES: BETWEEN ESTABLISHED PARADIGMS AND NEW FRONTIERS

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Keywords: acquisitive strategy, conservative strategy, functional traits, plant economic spectrum, trade-offs

Functional traits - morphological, physiological, or phenological characteristics that influence plant fitness - are pivotal for understanding how plants adapt to environmental constraints and allocate limited resources [1]. Functional ecology aims to uncover generalizable principles that govern plant performance, community assembly, and ecosystem functioning across spatial and temporal scales.

Among the most influential frameworks in this field is the *Leaf Economics Spectrum* (LES), which captures trade-offs in leaf traits along a continuum from resource-acquisitive (e.g., high SLA, high nutrient content) to resource-conservative strategies. The LES has proven valuable for predicting plant behavior across biomes and linking trait variation to ecosystem-level processes [2]. More recently, this conceptual model has been extended to belowground organs, culminating in the *Root Economic Space* (RES), which describes the multidimensional coordination of fine-root traits. In particular, the RES introduces a novel fungal collaboration gradient alongside the traditional acquisitive-conservative gradient of resource-use strategies [3].

As the field moves toward a whole-plant perspective, growing attention is being paid to the *Seed* and *Flower Functional Spaces*. These frameworks emphasize the ecological and evolutionary relevance of reproductive traits. Exploring how investments in seed mass, dispersal strategies, floral morphology, and phenology integrate with vegetative traits holds the potential to pioneer new directions in trait-based ecology [4, 5].

In summary, the development of a comprehensive "whole-plant economics" framework - including leaves, roots, flowers, fruits, and seeds - promises to enhance our understanding of plant ecological strategies [6]. This unified approach may reveal critical insights into plant adaptation and persistence across diverse habitats, particularly in the context of environmental disturbances and climate change.

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PLANT DIVERSITY ACROSS ITALIAN AGRICULTURAL LANDSCAPES: INTEGRATING TAXONOMIC, FUNCTIONAL, AND PHYLOGENETIC DIMENSIONS

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Keywords: diversity, functional traits, habitat monitoring

Agricultural landscapes are complex mosaics of ecosystems, including croplands, forests, grasslands, shrublands, and wetlands. These habitats support diverse plant communities, each contributing uniquely to overall biodiversity and ecosystem services. However, the roles of different community types in supporting functional and evolutionary diversity remain underexplored [1]. This study aims to identify conservation priorities by integrating taxonomic, functional, and phylogenetic dimensions of plant diversity across agricultural landscapes.

We surveyed 47 circular study areas (1 km radius) distributed across Italy in different biogeographical and management contexts. A total of 235 plots, each measuring 5×5 m (25 m²), were surveyed within the five main ecosystem types. Taxonomic diversity was assessed using α- and β-diversity metrics, Indicator Species Analysis (INSPAN) and PERMANOVA to assess floristic composition. Preliminary results show that grasslands support the highest α-diversity, while wetlands contribute most to β-diversity, indicating the presence of unique species assemblages. Each ecosystem type also supports specific indicator species, including *Papaver rhoeas* in arable land, *Acer campestre* in woodlands, *Dactylis glomerata* in grasslands, *Prunus spinosa* in shrublands, and *Phragmites australis* in wetlands. The analysis of taxonomic diversity highlights wetlands as key ecosystems for the conservation of plant biodiversity in Italian agricultural landscapes, due to their distinct floristic composition. However, all ecosystem types contribute significantly to the conservation of specific plant species and communities. Maintaining a balanced mix of natural, semi-natural, and human-modified habitats is therefore essential. Ongoing analyses of functional traits and phylogenetic diversity will provide additional insights into community assembly processes and ecosystem resilience. By integrating these dimensions, we aim to better understand plant community responses to land use change and guide evidence-based conservation in agricultural contexts. This approach emphasises the importance of landscape heterogeneity as a key driver of biodiversity and ecological stability [2].

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GLOBAL PATTERNS OF PLANT COMMUNITIES AND FUNCTIONAL TRAITS IN FIRE-PRONE ECOSYSTEMS

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Keywords: fire-prone ecosystems,flammability, functional-traits

Fire is a critical ecological disturbance with both ecological benefits and socio-economic implications. Fire regimes across the globe are jointly shaped by climate and vegetation characteristics [1]. While the role of plant characteristics such as fuel load and flammability has long been recognized, recent studies have emphasized how the composition of other plant traits linked to fire responses, but also to growth and competitive ability can dramatically impact the fire regime [2,3]. Here we aimed to test this idea by analyzing plant communities and fire history in different ecosystems across the world.

To address this aim we combined global datasets on plant traits (e.g., TRY, AusTraits, Flamits), community composition (from sPlot), climate data, and remote sensing fire data (from MODIS/VIIRS). We first assessed global patterns of plant trait co-variation in fire-prone ecosystems. We then fit models to test how plant trait syndromes and community composition are related to different fire regimes under similar climatic conditions globally.

Preliminary results confirm that in areas historically affected by fire, communities tend to have higher overall flammability. Additionally, the presence and/or abundance of species with favorable post-fire adaptations increases within plant communities, suggesting the presence of a positive feedback mechanism. However, our models also suggest that these relationships between fire-related traits and wildfires globally are indeed modulated by plant traits associated with growth and competition.

Our findings provide valuable insights for fire management, ecosystem restoration, and reforestation efforts by highlighting the complex influence of community functional composition on fire dynamics.

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BUILDING A BOUQUET FOR POLLINATORS: MODERATE GRAZING DRIVES THE DIVERSITY OF FLOWER TRAITS IN SEMI-NATURAL GRASSLANDS

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Keywords: functional diversity, grazing management, habitat 6210(*), mountain abandonment, structural equation modeling

Semi-natural grasslands are among the most biodiverse habitats in Europe and support a broad array of insect pollinators, many of which are in decline [1, 2]. Although the effects of grazing on taxonomic and vegetative functional diversity are well documented, its influence on flower trait diversity - critical for pollinator attraction and plant reproduction - remains poorly understood [3]. Traits such as reflectance, morphology, and phenology shape plant–pollinator interactions, and understanding their response to grazing is essential to inform sustainable grassland management.

This study investigates the relationships between grazing regimes and the diversity of flower traits in a semi-natural habitat of conservation concern across Italy and Switzerland. We sampled 116 plots of 16 m² within semi-natural grasslands measuring seven flower morphological, phenological, and reflectance traits relevant to plant-insect interactions. We compared ungrazed areas and extensive farms, and across farmed areas we inferred the direct and indirect effects of grazing regimes on taxonomic diversity (TD), and on flower traits' functional diversity (FD), and community-weighted means (CWMs).

We found that grazing did not significantly affect the FD of flower traits; however, it did favor species with larger, shorter, and pink flowers exhibiting high UV reflectance and longer flowering durations compared to ungrazed areas. Under different grazing regimes, fine-scale grazing intensity significantly influenced TD, with cascading effects on the FD and CWM of several traits, such as flower symmetry, color, and flowering phenology.

These findings suggest that maintaining extensive grazing and managing its intensity patterns at fine spatial scales may enhance the diversity of flower traits, which may, in turn, support a wide array of insect pollinators.

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OLD-ESTABLISHED MEDITERRANEAN CYPRESS FORESTS OF ITALY: DO THEY HOMOGENIZE PLANT DIVERSITY?

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Keywords: ancient plantations, biotic homogenization, italian cypress, plantation forests

Plantation forests can contribute to the process of biotic homogenization, especially in the case of putatively alien tree species: particularly, introduced conifer plantations can create structurally simplified communities, where scarce light conditions and acidic litter limit understory regeneration [1]. *Cupressus sempervirens* L. has been cultivated in Italy since ancient times [2]; however, its effects on understory vegetation remain unknown. Therefore, the aim of this study is to investigate biotic homogenization in the understory of ancient cypress plantations. We asked whether cypress: i) affects understory species diversity and composition; ii) affects understory functional diversity; iii) favors disturbance-related, generalist species.

We surveyed 66 plots in three old-established (over 500 years ago) cypress plantations in peninsular Italy. In each plot we recorded cypress canopy % cover, plant species occurrence and abundance, and environmental variables like soil chemistry and topography. Since environmental variables differed across forests - except for cypress cover - we used Site factor (the three forests) as a proxy for environmental variation. We also calculated community weighted means (CWMs) for plant traits (height, SLA, seed mass) and disturbance indicator values for each plot. We then related understory parameters (composition, species richness, species diversity, functional diversity, disturbance indicator values) to the gradient of cypress canopy cover and to the different sites.

Results show that cypress cover, ranging in our plots between 10% and 76%, does not influence species composition, as environmental factors instead drive the differences in understory plant composition. Plots cluster into three site-specific groups, suggesting distinct community identities, regardless of the presence of *C. sempervirens*. Specialist species associated with thermo-mediterranean habitat types remain unaffected. Further evidence is that cypress cover does not have a significant effect on alpha diversity. Likewise, cypress shows no homogenizing effect on functional diversity, which does otherwise differ between the three forests. Finally, disturbance indicator values for understory species do not vary significantly, either across the three sites or in relation to cypress cover, suggesting no facilitation effect of cypress on opportunistic, disturbance-related species.

Our findings suggest that *C. sempervirens* in old-established plantations shows no homogenizing effect on understory plant communities. A likely explanation is that its relatively narrow canopy does not limit light availability for understory plants like other conifers do. In our study the Ellenberg-type ecological indicator value for light availability does not vary significantly with cypress cover. Overall, ancient Italian cypress plantations seem to be rather interesting sites, whose naturalistic value is not lessened by the dominance of this historically introduced species.

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CAN LEAF-LEVEL SPECTROSCOPY SUPPORT PLANT DIVERSITY MONITORING IN ALPINE GRASSLANDS?

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Keywords: hyperspectral, optical traits, radiative transfer, vegetation indices

Declining grassland biodiversity compromises key ecosystem services related to plant productivity, carbon storage, and pollination (Lamarque et al., 2011), making grassland conservation a priority. Traditional field inventories are costly and time-consuming (Wang & Gamon, 2019), whereas using reflectance spectra holds promise for plant diversity monitoring, allowing the discrimination of species or plant functional types (Cavender-Bares et al., 2017; Schweiger et al., 2017). With rapid, low-cost leaf- and canopy-scale measurements and imaging spectroscopy for continuous landscape-level mapping, hyperspectral data provide a non-destructive and scalable approach to biodiversity monitoring (Kothari et al., 2022). The accurate assessment and mapping of biodiversity based on plant spectra depend on the ability to spectrally distinguish among species or plant functional types. This requires reliable spectral discrimination of endmembers, as each species or functional group exhibits unique spectral characteristics related to structural and biochemical properties. In this context, our study aims to investigate the spectral separability of dominant species in alpine grassland communities and assess which spectral features (i.e., full spectral information, vegetation indices, optical traits estimated through radiative transfer model inversion) most influence such separability. To achieve this, we rely on leaf-level spectra of the most abundant species from nineteen 5m × 5 m plots in alpine grasslands located in the Swiss National Park (CH). Leaf-level spectra of more than 400 samples were measured using a field spectroradiometer (350-2500 nm spectrum range) with a leaf clip probe. Preliminary results based on permutational multivariate analysis of variance reveal significant spectral differences between grass species and other functional groups. Hierarchical cluster analysis was carried out based on distance matrices calculated both for each single spectral feature type and all spectral features combined, with dendrograms split into clusters according to the results of a virtual dimensionality assessment. Clustering results show that a large portion of the species can be isolated based on their spectral features, with the clustering based on vegetation indices exhibiting the best results. These findings highlight the potential of spectroscopy data for improving species discrimination and supporting efficient biodiversity monitoring in alpine grassland ecosystems.

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COMPARATIVE ANALYSIS OF LEAF TRAITS IN *QUERCUS CERRIS* L. AND *Q. FRAINETTO* TEN. UNDER URBANIZATION PRESSURE IN THE MEDITERRANEAN REGION

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Keywords: monitoring, plant functional traits, urban ecosystem

Quercus cerris L. and *Quercus frainetto* Ten., as amphi-Adriatic species, share the Italian Peninsula as the western limit of their natural distribution. Both typically grow simpatrically in mixed forests on flat lands and hillsides that can be classified under the 91M0 habitat type, which includes thermophilous-acidophilous Turkey oak woods and Hungarian oak-dominated forests. These forests are of particular relevance in regions where urban expansion over recent decades has led to the partial conversion of woodlands into agricultural and industrial areas, promoting a mosaic of natural and semi-natural green spaces within and around urban environments [1]. An example is the municipality of Campobasso (Molise). Understanding the ecological traits and climate adaptability of these species is essential for evaluating the ecosystem services they provide and for informing reforestation and afforestation initiatives under the National Recovery and Resilience Plan and the National Biodiversity Future Center in which this study is involved. This study assessed the physiological and ecological responses of *Q. cerris* and *Q. frainetto* across Urban Forests (UF) and Natural Forests (NF). In each stand, a phytosociological survey was conducted, and several abiotic parameters were recorded. Satellite-derived environmental variables included: Land Surface Temperature (LST), Precipitation (PPT), Actual Evapotranspiration (ACTEVP), and Soil Moisture (SMOI). In seven individuals of each stand, six leaf functional traits were analysed: Specific Leaf Area (SLA), Leaf Dry Matter Content (LDMC), Leaf Thickness (Lth), and Chlorophyll, Anthocyanins, and Flavonols content [2]. The samplings were conducted in June, July, and September 2023. The data were analysed using two-way ANOVA to assess the significance of observed trait variations.

From the phytosociological surveys these woods belong to the *Crataego laevigatae-Quercion cerridis* alliance (Arrigoni 1997). The ANOVA results indicate species-specific and site-specific responses. For *Q. cerris*, SLA decreased steadily from June to September in both the forest types (UF and NF), with an associated increase in LDMC and Flavonols content, particularly in Natural Forest. For *Q. frainetto*, SLA peaked in July before declining, and anthocyanin levels showed a July peak in both contexts, potentially indicating transient oxidative or drought stress. Leaf thickness and chlorophyll contents showed variable trends depending on site and season.

Preliminary results suggest that *Q. cerris* displays greater plasticity under urban conditions with respect to *Q. frainetto*, potentially indicating a higher adaptability to possible climate change. *Q. frainetto* appears more sensitive to seasonal stress, as reflected by fluctuations in SLA and secondary metabolites. However, given the duration of the study, further long-term monitoring is needed to robustly assess species resilience and their potential role in urban forest management under Mediterranean climate scenarios.

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PHYLOGENETIC DIVERSITY PATTERNS OF BROAD-LEAVED FORESTS IN RESPONSE TO HISTORICAL CLIMATE DYNAMICS

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Keywords: biodiversity conservation, broad-leaved forests, historical climatic variability, phylogenetic diversity

Broad-leaved forests are a dominant component of the European landscape, vital for sustaining biodiversity and delivering key ecosystem services. Investigating how past climate dynamics have shaped their current diversity is essential to understand their resilience to ongoing and future environmental changes [1,2]. In this study, we analyzed the influence of long-term climatic fluctuations on phylogenetic diversity in five Italian protected areas distributed along a latitudinal gradient from Mediterranean to temperate bioclimatic zones. We established 288 vegetation plots using a probabilistic sampling design along elevational gradients within each site, capturing a wide array of forest types ranging from evergreen Mediterranean forests to temperate deciduous stands. For each plot, plant species cover was recorded separately for canopy, understory, and herbaceous layers, enabling a detailed description of vertical forest structure and community composition. To assess the potential impact of historical climate variability, we extracted paleoclimatic data from the CHELSA database covering the period from the Last Glacial Maximum (~22,000 years ago) to the present, with 100-year temporal resolution. We then computed the standard deviation of climatic variables over time for each site as a proxy for historical climatic instability. Our findings suggest that long-term climatic variability has significantly influenced the phylogenetic structure of forest communities, with effects varying across vegetation layers. Moreover, contrasting responses were observed between evergreen and deciduous broad-leaved forests, indicating a strong interplay between forest type and climatic legacy. This research provides valuable insights into how historical climate dynamics continue to shape present-day biodiversity patterns and highlights the importance of incorporating long-term perspectives into forest conservation planning. It also offers a framework for anticipating shifts in species distributions, particularly of evergreen broad-leaved taxa, under future climate scenarios.

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PLANT SOCIOLOGY AND VEGETATION SCIENCE HAVE LONG PROVIDED TOOLS FOR UNDERSTANDING, PRESERVING AND IMPLEMENTING THE NATURE RESTORATION

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Keywords: Flora, vegetation, plant sociology, restoration ecology, nature restoration law

The abiotic, biotic, and landscape characteristics of a territory are best synthesised by flora and vegetation. Starting from the discrete distribution of vegetation, phytosociology, which recognizes the centrality of flora and plant communities, and the dynamics between serial stages and between series of vegetation, remains the best reference to qualify and quantify the environmental heterogeneity and conservation status of a territory. A summary of the stages that have characterized knowledge in the national vegetation field of recent decades, with the effort of Prof. Edoardo Biondi.

The results obtained emphasize the uniqueness and relevance of knowledge about flora and vegetative dynamism as a fundamental element for assessing the conservation status of habitats and ecosystems, and for contributing to the implementation of restoration ecology. The application of the European Regulation dedicated to the restoration of nature involves a phytosociological approach that is completely central in this new ecological vision. Regulation requiring very detailed background knowledge. Individual countries should define a 'plan' related to the CBD in its broad lines by 2026, but they should be able to define with extreme detail the actions necessary to restore the resilient state for each polygon evaluated in a bad state of conservation.

It is therefore easy to assume a new spring for the deductive phytosociology that has already allowed us to know and map the series of vegetation in Italy for more than ten years. The main factor that influenced the definition of the Ecoregions of Italy, the Ecosystems of Italy, and the red list of ecosystems in Italy. Combining knowledge and intensive detail sampling can be used to bring nature back into our lives and respect the objectives of the European Regulation dedicated to the restoration of degraded ecosystems.

THE CONTRIBUTION OF EDOARDO BIONDI TO THE ADVANCEMENT OF GEOBOTANY IN SARDINIA

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Keywords: palaeobotany, phytosociology, vegetation science

Sardinia is one of the central-western Mediterranean islands, recognized as part of the Tyrrhenian Island macro-hotspot and the broader Mediterranean mega-hotspot [1]. The rich biodiversity of the island, including species of phylogeographic and conservation interest [2], the presence of extensive unurbanized areas, and the variety of environments shaped by different geological substrates and bioclimatic zones [3] have made it a focal point for numerous internationally recognized naturalists and botanists. These researchers have contributed in various ways to expanding the scientific knowledge of the region. Among the plant scientists who have made significant contributions to the botanical knowledge of the island between the end of the last century and the beginning of the current century, one prominent figure was Edoardo Biondi (1944-2024). Professor Biondi published 36 scientific articles and three book chapters on Sardinia throughout his career. These contributions span three decades, from 1979 to 2009.

His early contributions focused on palaeobotanical studies, including detailed analyses of Miocene fossil forests, which led to the description of the new fossil species *Palmocaulon logudorense* (Arecaceae), *Tetraclinoxylon anglonae* (Cupressaceae), *Arganioxylon sardum* (Sapotaceae) and *Sclerocaryoxylon chiarugii* (Anacardiaceae), the last two being also new genera.

In the following years, he shifted his focus to vegetation studies, applying the classical phytosociological method and, afterwards, the synphytosociological and geosynphytosociological ones. Specifically, he concentrated on ruderal and synanthropic vegetation in northern Sardinia and Cagliari, along with pastures, riverbeds, and shrublands. However, his primary interest was in coastal areas, including sandy, rocky, and lagoon habitats and small islands, particularly the La Maddalena Archipelago. He visited this area frequently from the 1990s, publishing three contributions on the flora and vegetation of the Archipelago.

From the early 2000s, his deep knowledge of the territory enabled him to coordinate synthesis studies of various syntaxa of the *Quercetea ilicis* class and the *Limonietalia* order in Sardinia.

The studies on vegetation series and landscape models, which began in the Nurra region and continued in the La Maddalena Archipelago, culminated in 2009 with a paper focused on the vegetation series of Sardinia, completed with a map, which remains a reference point for botanical studies and beyond in the region to this day.

A distinctive feature of Edoardo Biondi is that he was not a solitary scientist, unlike others who worked on the island. He collaborated extensively with botanists from the Universities of Cagliari and Sassari, generously sharing his knowledge and expertise.

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MAPPING VEGETATION AND HABITATS BY INTEGRATING DRONE TRUTHING AND REMOTELY SENSED MULTISPECTRAL SEASONAL VARIATIONS

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Keywords: ground-drone truthing, habitat monitoring; remote Sensing time series, supervised vegetation mapping,

Phytosociological maps play a crucial role in biodiversity monitoring and conservation efforts [1-2]. Supervised classification of remotely sensed spectral seasonal variations using machine learning algorithms has proven to be highly accurate, even when distinguishing numerous vegetation types or habitats [3]. However, the success of this approach is largely dependent on the availability of extensive, high-quality reference data - something that cannot be fully achieved by field surveys alone. Thus, the main limitation of vegetation mapping is not the processing of satellite imagery, but the collection of adequate training data for machine learning models [4]. To address this issue, we propose the use of drones equipped with optical zoom cameras to collect vegetation data. Carefully designed protocols were implemented to acquire ultra-high-resolution imagery that allowed phytosociologists to identify species, estimate their abundance within plots, and assign them to specific vegetation categories. These drone-derived observations were then used to train machine learning models to detect vegetation types in Sentinel-2 multispectral time series. The method was applied to several Natura 2000 sites in the Marche region (central Italy), covering a range of forest, shrub and grassland habitats in a temperate sub-Mediterranean bioclimatic context. For each site, between 700 and 1000 plots were validated and assigned to the relevant vegetation types. These reference datasets were used for both training and validation of the classification models, which achieved overall accuracies (OA) between 89% and 92% across all study areas. The results underline the effectiveness of the method in producing accurate vegetation maps, while also highlighting the value of drone-based data collection. Drone truthing allows the creation of large, spatially representative reference datasets - essential for reliable classification - that capture the spectral and phenological variability necessary to distinguish different vegetation types. In addition, the integration of drone-derived data with supervised classification of Sentinel-2 time series enables regular updates of vegetation and habitat maps. The ultra-high resolution imagery also provides a valuable photographic archive, capturing even small or fragmented habitats and complementing traditional phytosociological maps as a resource for long-term monitoring. This integrated approach contributes to habitat assessment and restoration activities in line with the objectives of the Habitats Directive and EU Restoration Law. Finally, drone-based ground truthing should be seen as a complementary tool to traditional methods such as the Braun-Blanquet approach - just as a botanist relies on a hand lens or a small hoe, drones can support species identification and plot classification in difficult or inaccessible environments.

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AN OVERVIEW OF MOUNTAIN PEATLAND VEGETATION OF APENNINES, SICILY AND SARDINIA (ITALY)

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Keywords: Mediterranean mountain vegetation, hygrophilous vegetation, vegetation monitoring

Based on literature data, the state of knowledge on upland peatland vegetation of Apennines, and the major Islands (Sicily and Sardinia) is outdated, as for most countries in Europe [1]. Upland mires in Italy have a very rarefied and fragmentary distribution and most of them persist in climatically optimal mountain refugia. These particular biotopes show a high biogeographic value since they are the southernmost *Sphagnum*-mires in Europe [2]. Mediterranean peatlands are themselves located at the climatic limit for peat formation [3], consequently they are potentially more vulnerable to degradation by climate change and anthropogenic disturbances [4].

54 publications concerning biological and environmental data (floristics, vegetation, ecology) were analyzed. 72% of them were published before 2015, while only 28% in the last 10 years. Besides, 220 peatland sites were found. Only 61 of them are georeferenced, while 33, although not georeferenced, are identifiable in the territory coinciding with known local references. As regards sites recently confirmed, it results that only 53 sites are still present in optimal conditions; 5 sites have been declared extinct, while for the remaining 162, no recent information on their current existence is available. The largest number of described sites is concentrated in the Tuscan-Emilian Apennines (60), followed by Sicily (51 sites), and Calabria (42). The vegetation belongs to 38 phytosociological associations, 19 sub-associations and variants, 54 groupings of 6 different classes (*Scheuchzerio palustris-Caricetea fuscae* Tx. 1937; *Molinio-Arrhenatheretea* Tx. 1937; *Phragmito-Magnocaricetea* Klika in Klika et Novak 1941; *Montio-Cardaminetea* Br.-Bl. et Tx. ex Klika et Hadač 1944; *Littorelletea uniflorae* Br.-Bl. et Tx. ex Westhoff et al. 1946; *Oxycocco-Sphagnetea* Br.-Bl. et Tx. ex Westhoff et al. 1946). Most of the sites analyzed are brown mosses fens and transitional mires colonized by small sedge (*Caricion davallianae* Klika 1934) and rush beds, swards (*Dactylorhizo-Juncion striati* S. Brullo et Grillo 1978), and by more oligotrophic vegetation with *Sphagnum* peat mosses (*Caricion fuscae* Koch 1926 nom. conserv. propos.). The main disturbances are: uncontrolled grazing by domestic livestock and wild fauna that causes trampling physical damages and also chemical alterations (nutrient load modifications) due to the dung release on the surface; road construction, which causes local water regime alterations; groundwater catchment for agricultural or mountain village supplies.

New investigations are urgently needed to update the state of Italian upland peatland's knowledge, which is the basis for all conservation strategies prescribed by National, European and International policies.

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PHYTOSOCIOLOGICAL INTERPRETATION OF THE EU HABITAT 6220* IN SARDINIA

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Keywords: Habitats Directive, syntaxonomy, vegetation science

The monitoring of the EU habitat 6220* (Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea*) presents several challenges related, among other practical issues, to the different syntaxonomic placement of the vegetation types it can be associated with, and the consequent variety of interpretations that have been given over time to the reference syntaxonomic units. The Interpretation Manual of EU Habitats indicates that this habitat in Italy should be referred to three vegetation classes: *Thero-Brachypodietea*, *Lygeo-Stipetea* and *Poetea bulbosae* [1]. Later, the Italian manual of EU habitats [2] specifies the list of phytosociological alliances of reference: 5 for the class *Lygeo-Stipetea*, 3 for the class *Poetea bulbosae* and 4 for the class *Helianthemetea guttati*. However, the Prodrome of Italian vegetation [3], following Biondi et al. [4], includes the perennial communities with *Brachypodium retusum* in the *Artemisietea vulgaris* class, whereas Mucina et al. [5] moved back these communities to the class *Lygeo-Stipetea*. Moreover, they upgraded the suballiance *Ornithogalo corsici-Trifolienion subterranei* [6] to the alliance level, as a Cyrno-Sardinian vicariant of the *Periballio-Trifolion subterranei* within the *Poetea bulbosae* class, and divided the *Tuberarietea guttatae* class in two different classes: *Helianthemetea guttati* and *Stipo-Trachynietea distachyae*. Finally, Biondi et al. [7,8] moved geophytic communities with autumn-winter flowering to the order *Bellido sylvestris-Arisaretalia vulgaris,* within the new class *Charybdido pancratii-Asphodeletea ramosi*. In this contribution we present field data on the monitoring of this complex habitat, conducted in Sardinian Natura 2000 sites in the years 2024-25 by means of phytosociological surveyes randomly gathered in 2×2 m plots. Preliminary results show that, in addition to the already known communities with annuals (*Tuberarietea guttatae*), ovine pastures (*Poetea bulbosae*) and thermo-xerophilous perennial communities with *Lygeum, Hyparrhenia* and *Brachypodium*, other communities are worth to be included in this habitat, particularly secondary meadows dominated by *Dactylis,* rich in orchids (*Brachypodio ramosi-Dactyletalia hispanicae*), and autumn-winter flowering geophytic communities (*Bellido sylvestris-Arisaretalia vulgaris*), in accordance to Fois et al. [9]. We conclude that a detailed updating of the EU Habitat Directive is urgently needed, specifically to include in this priority habitat all those steppe-like Mediterranean communities worthy of preservation and appropriate management.

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THE OAK FORESTS OF THE EUGANEAN HILLS (VENETO)

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Keywords: biodiversity, habitat 91AA,* Quercus petraea

In 2019, the Euganean Hills Park Authority funded research on the thermophilic oak forests of the park to clarify issues related to phytosociological classification, functional to the definition of N2000 habitats. This contribution is based on 71 phytosociological relevés conducted between 2019 and 2021. The Euganean Hills exhibit a wide variety of geological substrates. The climatic conditions in this area are distinctive: average temperatures are comparable to those of the surrounding Po valley plain, but the climate is milder due to the attenuation of extreme temperatures. Chestnut woodlands (habitat 9260) and oak forests dominated by *Quercus petraea* prevail on volcanic substrates, while *Quercus pubescens* forests are more common on limestone substrates. The classification of phytosociological relevés identified three distinct forest groups: *Q. pubescens* forests, *Q. petraea* mesophilic forests and *Q. petraea* thermophilic forests. The *Q. pubescens* forests are ascribable to the *Carpinion orientalis* Horvat 1958 alliance. These forests were which were preliminarily attributed to the N2000 habitat 91H0* are now included within habitat 91AA*. The more mesophilic *Q. petraea*-dominated forests are classified in the *Erythronio dentis-canis–Carpinion betuli* (Horvat 1958) Marinzek in Wallnofer, Mucina & Grass 1993 alliance (habitat 91L0) [1]. The thermophilic *Q. petraea* woods are the most peculiar oak forest type in the study area. The most frequent species in these communities (e.g. *Mespilus germanica*, *Teucrium siculum, Hieracium racemosum*, *Genista tinctoria*, *Genista germanica*, *Lathyrus niger*) are normally associated to the *Crataego laevigatae-Quercion cerridis* Arrigoni 1997, an alliance that was supposed not to extend further north than the Northern Apennines [2]. Furthermore, the understorey of these woods includes *Arbutus unedo* and *Erica arborea*, typical Mediterranean maquis species which are here close to their northernmost limit of distribution. Accordingly, we propose to include these thermophilic *Q. petraea* communities in habitat 91AA*, as already done for the *Q. pubescens* forests. The individuals of *Quercus petraea* found in these communities exhibit some morphological traits close to those considered diagnostic for *Q. petraea* subsp. *polycarpa*. However, two studies carried out on the thermophilic oak forests of the Euganean Hills [3,4], which analysed from a morphological and geometric morphometric point of view a high number of *Q. petraea* individuals, did not reveal sufficient differences in diagnostic traits to separate at the subspecies level the two forms of *Quercus petraea* found in the study area. This result agrees with what has already been highlighted in recent taxonomic and molecular studies carried out by other authors on the *Q. pubescens* collective group [5,6,7].

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CHANGES IN *STIPA AUSTROITALICA* GRASSLAND COMMUNITIES OVER TWENTY YEARS

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Keywords: community ecology, grassland ecology, resurvey, semi-natural ecosystems, succession dynamic.

Endemic dry grasslands dominated by *Stipa austroitalica* are recognised for their conservation relevance, due to their narrow southern-Italian distribution and for being listed among EU habitats of community interest [1]. Although the occurrence and preservation of these semi-natural communities depend on a combination of anthropogenic and natural factors, little is known on their responses to recent and ongoing environmental changes [2]. While documenting community changes over two decades, this study aims to provide an updated depiction of the conservation status of *S. austroitalica* grasslands in the agro-pastoral systems of Alta Murgia and Murgia Materana, in southern Italy.

In 2023, we resurveyed 20 vegetation plots that were originally sampled in 1995–2003 [3]. Species richness and diversity, and the proportion of ecological attributes (life forms, Ellenberg's indicator values) were used to explore community variations. We used paired T-test and Non-metric multidimensional scaling to identify significant changes in vegetation parameters and species composition. For each plot, we grouped species according to their dominance (> 95th percentile of abundance distribution) and their affiliation to main syntaxonomic categories. Then, we calculated species turnover index to assess the proportion of increasing and declining species.

Our study demonstrates that species composition and community parameters have changed significantly in the last 20 years. Recent surveys showed a significant increase in species richness and diversity, coupled with a lower cover of perennial grasses and an increase in short-lived plants and geophytes. Our findings indicated an increase in Ellenberg's indicator values for light and temperature, and a decrease in continentality and pH. Multivariate ordination highlighted a consistent variation in the considered timeframe, indicating a shift of species composition towards more xero-thermic communities. Species turnover values underlined a marked decline of species that were dominant in the original samples, and for species that are typically associated with meso-xeric perennial grasslands, in turn replaced by those associated with more xero-thermic and synanthropic vegetation.

By revisiting historical data, our study allows us to identify temporal dynamics and ecological processes in the studied ecosystems, indicating a recent and substantial decline of meso-xeric perennial communities, in favour of communities adapted to warmer and highly disturbed environments. Different anthropogenic and natural factors likely acted as drivers of community responses, e.g., an altered grazing regime, wild boar soil disturbance, and variations in climate conditions, in turn associated with an increase in the frequency of wildfires and local soil erosion processes. In view of preserving the biodiversity value of the studied semi-natural grasslands, restoration and management strategies should be tailored to address the ongoing trends of habitat transformation.

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ECOLOGY AND PHYTOSOCIOLOGY OF *TRICHOLAENA TENERIFFAE* (POACEAE) IN ITALY

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Keywords: coastal dunes, phytosociology, vegetation

Tricholaena teneriffae (L.f.) Link is a caespitose grass with a wide distribution in arid and semi-arid areas ranging from Macaronesia to northern and south-eastern Africa, the Arabian Peninsula and India [1]. In Europe, it is found exclusively in the territory of the Strait of Messina, between the provinces of Reggio Calabria and Messina, an area with a thermo-mediterranean, dry or sub-humid bioclimate, annual average temperatures of around 18°C and rainfall between 500 and 900 mm [1]. In this territory, *T. teneriffae* is localised on sandy, oligotrophic substrates, under conditions of high edaphic aridity, sunny exposures, characterizing formations dominated by caespitose grasses of the class *Lygeo sparti-Stipetea tenacissimae* Rivas-Martínez 1978 [1], such as the mediterranean steppe grasslands of the sandy hills of the *Tricholaeno teneriffae-Hyparrhenietum hirtae* (Wildpret & Rodriguez in Rivas-Martínez et al. 1993) Brullo, Scelsi & Spampinato 1997 and highly disturbed road environments, such as road scarps, again on loose substrates with sandy grain size, where it characterises the sub-nitrophilous and synanthropic plant communities of *Tricholaeno teneriffae-Oryzopsietum miliaceae* Brullo 1984 [2, 3]. Research on Calabria's flora and vegetation has also made it possible to observe the species in coastal psammophilous environments. To investigate the distribution and ecology of *T. teneriffae* further and define its sociological characteristics more precisely, 30 phytosociological relevés were carried out in the different habitat types where the species lives and plays a structuring role. The multivariate analysis of the relevés matrix showed that *T. teneriffae* occurs in three different groups of plant assemblage, characterising, in addition to the two communities already known in the literature and previously mentioned of *Lygeo sparti-Stipetea tenacissimae* class, also psammophilous dune vegetation of the class *Euphorbio paraliae-Ammophiletea australis* referable to habitat type 2110: “Embryonic shifting dunes” of Annex I of EEC Directive 43/92. In this community, the species settles in phytocoenoses dominated by *Thinopyrum junceum* (L.) Á. Löve, associating with *Pancratium maritimum* L., *Medicago marina* L., *Lotus cytisoides* L., *Matthiola sinuata* (L.) W.T.Aiton. Here, *T. teneriffae* plays a structuring role in the succession of dune vegetation, as highlighted by its high values of coverage and abundance, to justify its attribution to the role of guide species within the psammophilous phytocoenoses analysed. The results obtained in the Strait of Messina area, following those reported for the Canary Islands [4], suggest a greater ecological range of the species and its ability to colonise even coastal dune environments beyond the steppe-like ones of the *Lygeo sparti-Stipetea tenacissimae* class. This study shows that *T. teneriffae*, considered in Italy a relict of the thermo-xerophilous flora in Italy exclusive to southern Calabria and Sicily [1], is a component of the natural coastal vegetation of embryonic shifting dunes where it probably has its primary habitat. The presence of the species in habitats of Community interest raises conservation questions, especially in a highly anthropised area such as the Strait, where dune systems are threatened by erosion, urbanisation and tourism.

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THE VEGETATION OF THE ORDER *BELLIDO SYLVESTRIS-ARISARETALIA VULGARIS* BIONDI 2017 IN THE WESTERN MEDITERRANEAN, WITH A PARTICULAR FOCUS ON SARDINIA

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Keywords: autumn flowering geophytes, Charybdido pancratii-Asphodeletea ramosi, *phytosociological surveys, TWIN SPAN*

Perennial plant communities flowering from the end of summer to autumn and winter is a unique feature of Mediterranean vegetation [1]: however, the phytosociological aspects have been explored only in the last decades. In 2008, Pérez-Latorre et al. [2] described the new alliance *Ranunculion bullati* for Spain, consisting of the association *Scillo autumnalis-Ranunculetum bullati* (class *Helianthemetea annuae*). This new alliance was not considered in 2016 by Mucina et al. [3], whereas one year later Biondi et al. included it in the new order *Bellido sylvestris-Arisaretalia vulgaris* [4] within the class *Charybdido pancratii-Asphodeletea ramosi* [5]. Within this new order, Biondi et al. [4] also included the Tyrrhenian *Leontodonto tuberosi-Bellidion sylvestris* [6], and described two new alliances for peninsular Italy: *Cyclamino hederifolii-Arisarion vulgaris* and *Cyclamino hederifolii-Ranunculion bullati*, the latter vicariant of the Iberian *Ranunculion bullati*. Finally, De Foucault in 2024 [7] established two new alliances: *Colchico filifolii-Moraeion sisyrinchii* (Iberian Peninsula and Mediterranean France) and *Colchico graminei-Moraeion sisyrinchii* (Morocco). Here we present an overall synthesis of the alliances included in the order *Bellido sylvestris-Arisaretalia vulgaris* and examine in depth the communities growing in Sardinia. The study was based on 68 phytosociological surveys gathered in 0.5×0.5 to 2×2 m^2 plots, with 108 taxa. Preliminary results obtained with TWINSPAN elaboration showed two main Sardinian clusters: the first is a southern assemblage differentiated by *Juno planifolia* and *Prospero obtusifolium* subsp. *intermedium*; the second is a central-northern group, differentiated by *Moraea sisyrinchium* and *Squilla undulata*, with a subcluster on acidic soils differentiated by *Ophioglossum lusitanicum*. These preliminary data highlight the need for careful surveying on limited surfaces in the proper period (autumn-winter) to underline the biogeographical significance of these geophytic communities, at the edge between associations and synusia [8], whose complete phytosociological interpretation still needs more data and future in-depth analyses.

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VEGETATION CLASSIFICATION AND CHANGES OF THE COASTAL WETLANDS OF THE CATANIA PLAIN (EASTERN SICILY)

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Keywords: coastal habitats, diachronic analysis, saltmarsh vegetation, wetland loss.

Coastal wetlands are among the most threatened ecosystems in the Mediterranean area [1]. Today more than ever it is crucial to understand the past landscape in order to correctly plan environmental restoration and biodiversity conservation actions [2]. In Sicily, the coastal saltmarshes, very localized and some small in size, host very specialized and well-structured plant communities, often with floristic elements exclusive to the island or at the limit of their distribution area [3]. The main objective of this study is to reconstruct the past landscape of the Catania Plain coastal area (eastern Sicily) through the investigation of relict vegetation. During the field investigations (2021-2025), 260 phytosociological relevés using the Braun-Blanquet approach were collected. The perennial communities of the *Salicornietea fruticosae, Juncetea maritimi, Phragmito-Magnocaricetea,* and *Nerio-Tamaricetea* classes were detected. The original Braun–Blanquet sampling scale was transformed into the ordinal scale according to Van der Maarel [4]. All relevés were analyzed using multivariate methods (PC-ORD 6 software). Photointerpretation of ancient maps (1866, 1879, 1901, 1943, 1971) and recent aerial photos (2024) has allowed the reconstruction of the past coastal landscape (wetlands) of the Catania Plain and its transformations over the last 150 years. Overall, 13 coastal plant communities were surveyed, belonging to 4 phytosociological classes. The vegetation surveyed is represented by helophytic communities of *Phragmito-Magnocaricetea* (*Phragmitetum communis*, *Scirpetum maritimi*), by hygrophylous communities of *Juncetea maritimi* (*Juncetum acuti*, *Holoschoenetum globiferi*), by halophylous communities of *Salicornietea fruticosae* (*Junco subulati-Sarcocornietum alpini, Halimiono portulacoidis-Sarcocornietum alpini, Suaedetum verae*, *Arthrocnemo meridionalis-Juncetum subulati*, *Halimionetum portulacoidis*, *Junco subulati-Limonietum narbonense*, *Juncetum subulati, Agropyro scirpei-Inuletum longifoliae*), and by halo-hygrophilous woodland vegetation of the *Nerio-Tamaricetea* (*Tamaricetum gallicae*). Photointerpretation results show a strong reduction of coastal marshy habitats mainly represented by halophilous low-shrub communities (*Salicornietea fruticosae*) and rushes (*Juncetea maritimae*), as well as by aquatic vegetation (*Ruppietea maritimae* and *Potametea*).
In conclusion, the spread of *Phragmites australis* (common reed) is highlighted, whose expansion is mainly favored by the increase in soil nitrification to the detriment of halophilous shrubby vegetation (*Salicornietea fruticosae*) and sub-halophilous vegetation (*Juncetea maritimi*).

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GREEN ROOFS AS HABITATS TO RESTORE PREALPINE DRY GRASSLANDS: THE CASE STUDY OF BRESCIA MUNICIPALITY (NORTHERN ITALY)

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Keywords, ecosystem restoration, sustainability, vulnerable habitat

Dry grasslands in the Southern Prealps are found in small and scattered areas. Around the hills near the city of Brescia, these grasslands have been decreasing since the second half of the 20th century [1]. This is mainly because of natural reforestation and climate change, which create better conditions for trees and shrubs to grow [2]. These plant communities are known as "6210* Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites)" according to the EU Habitats Directive (92/43/EEC) [3].

As part of climate change adaptation strategies, the Municipality of Brescia included an action in the "Filo Naturale" project (Action A2.2: "creation of pilot green roofs and technical tools for their dissemination"). This action included a geobotanical study to describe the local pre-Alpine dry grasslands and their flora. The aim was to create an experimental protocol for introducing these plants into green roofs on a municipal building used for public housing, during roof renovation.

The biogeographical and geobotanical analysis of the Southern Prealps dry grasslands, including those near Brescia, was based on 600 vegetation surveys from the database of the Museum of Natural Sciences. These surveys were analyzed using fuzzy clustering. From the analysis, 41 surveys were selected as representative of the dry grasslands around Brescia. These communities are characterized by species such as *Bromus* gr. *erectus*, *Artemisia alba*, and *Eryngium campestre*.

The floristic composition of these communities was used to select the most suitable plant species for the experimental green roofs. The selection was based on two main criteria: the frequency and dominance of the species in the grassland communities, and the ecological preferences of each species, based on Landolt indicators [4], which are well suited for prealpine flora.

If this experiment is effective, the green roofs in the cities of Northern Italy could provide a space in the urban environment suitable for hosting communities with herbaceous structures that have nearly disappeared from the Po Plains and are in significant decline throughout the entire pre-Alpine region.

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RECONSTRUCTING THE PLANT LANDSCAPE OF A RENAISSANCE MARSH THROUGH THE LENS OF THE ERBARIO ALDROVANDI

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Keywords: ancient herbaria, aquatic plants, Po Plain, Valle Padusa

The herbarium of Ulisse Aldrovandi (15 volumes, more than 5000 specimens originally, dating back to 1551-1586, with collection sites often recorded with a precision not far from current standards), provides a rare opportunity to reconstruct the historical flora and plant landscape of Emilia-Romagna, reaching more than four centuries back in time, further than most other available sources allow [1]. A territory where Aldrovandi botanised various times is the Valle Padusa, an ancient, wide wetland extended landward for a hundred of km from the Adriatic coast, whose northern margin was River Po and southern one was not far from the Roman via Emilia. In his herbarium there are 84 specimens collected in this area, corresponding to 52 species as defined by current taxonomy. The aim of our work is to use such historical information to reconstruct the landscape of the Valle Padusa during the Renaissance, at the habitat level. To do so, we referred to the habitat classifications provided by Directive 92/43/EEC and the Emilia-Romagna regional habitat manual, which also includes habitats not listed in the Directive [2], to identify the structural species characteristic of each habitat. We then estimated the potential presence of a given habitat when at least 5 structural species were represented among the herbarium specimens, or 4 structural species and 1 companion species. The presence of paucispecific habitats was considered reasonable when the key structural species was found.

Under these criteria, it is possible to hypothesize the presence of the following habitats: 3150, 3260, 7210* and Pa (*Phragmites australis* cane thickets); we may suppose that habitats 3140 and Pp (*Parvopotamion*) were also present, since they are quite well represented in terms of species pool, despite the thresholds mentioned above are not met. Other habitats, i.e. 3160, 3270, 3290, 6420, 6430, 92A0, Ac (*Angelico-Cirsietum palustris*), Gs (*Glycerio-Sparganion*), Mc (*Magnocaricion*) and Sc (*Salicetum cinereae*) are represented by one structural species only, or companion species only, thus their presence is doubtful, even if plausible given their ecological features.

Our results offer a plausible reconstruction of the landscape of the Valle Padusa in the 16th century. While this approach, based on inferring habitat occurrence from possible species assemblages, cannot confirm the actual plant communities of that time, it does provide a reasoned list of habitats that may have been present. Ultimately, our findings underscore the continued relevance of historical herbarium collections in supporting efforts to reconstruct how environments looked like in the past.

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ASSESSING THE SHORT-TERM IMPACT OF SELECTIVE LOGGING VERSUS CLEAR CUTTING ON RIPARIAN FORESTS (STRUCTURE, TRAITS AND COMPOSITION OF UNDERSTORY) IN A MEDITERRANEAN RIVER

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Keywords: disturbance indices, forest management, forest structure, traits, riparian vegetation

Riparian forests are complex ecosystems whose structure and functioning relate to fluvial dynamics [1]. Anthropogenic interventions, including forest management, can disrupt these systems beyond their natural recovery capacity [2, 3]. This study evaluates the short-term (4 years post-intervention) effects of two contrasting forest management practices — clear-cutting and 25% moderate selective logging — on riparian forests along the Ombrone River (central Italy). Here, a long-term unmanaged reference area was included as a control.

Vegetation data were collected from 18 plots of 25 m² equally distributed among the three treatments. Structural metrics (forest layer height and cover), community-weighted means (CWMs) of key traits of the understory vegetation (life forms, clonality, riparian affinity, alien status, Specific Leaf Area or “SLA”, and Leaf Dry Matter Content or “LDMC”), along with disturbance indices (frequency and severity) and community composition were analyzed using univariate (ANOVA), and multivariate methods (PERMANOVA, SIMPER, PCA).

In comparison with control sites, clear-cut areas showed consistent shifts in their structural and compositional aspects: reduction of woody and riparian species, dominance of annuals and neophytes (e.g., *Artemisia verlotiorum*), increased disturbance intensity and frequency, and lower SLA and LDMC values, reflecting resource-conservative strategies under high-stress conditions. Selectively logged stands displayed intermediate conditions, with partial retention of nemoral and riparian taxa (e.g., *Brachypodium sylvaticum* subsp. *sylvaticum, Populus canescens*) and limited alien species spread.

Our findings suggest that moderate selective logging induces functionally analogous effects to natural disturbances, preserving structural complexity and facilitating post-disturbance regeneration pathways. In contrast, clear-cutting causes substantial shifts in vegetation assembly processes, leading to compositional simplification and higher invasibility. This study underlined the ecological cost of intensive interventions and supported the adoption of low-impact silvicultural practices in Mediterranean riparian forests.

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GREEN SPACES IN THE URBAN JUNGLE: HOW SPATIAL PATTERNS AND HUMAN DISTURBANCE SHAPE ECOSYSTEM SERVICES IN ROME

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Keywords: ecosystem services, urban ecology, urban planning, vegetation science

Urban green areas play a crucial role for both biodiversity and human well-being, offering a wide range of essential ecosystem services, such as habitat provisioning, climate regulation, and spaces for recreation (Kabisch et al., 2015; Tzoulas et al., 2007). Understanding the mechanisms underlying ecosystem service provision in urban contexts is thus crucial for informing effective management practices. In this context, we investigated how human disturbance, i.e. the amount of impervious surface, and the spatial configuration of the green areas, i.e. patch area, isolation, and shape, jointly influence the ecosystem services provided by the urban green areas of the city of Rome (Italy). Using data collected from 60 sites characterised by varying levels of human disturbance and different spatial configurations of green areas, we assessed key ecosystem services related to material (e.g. primary productivity, plant foraging, hay production and livestock), non-material (e.g. habitat provisioning, biodiversity, aesthetic, accessibility and usability), regulating and supporting categories (e.g. decomposition, pollination, flood control, climate regulation, and pest regulation). The composition and structure of urban vegetation strongly influences the delivery of these services, with plant diversity playing a key role in regulating multiple ecosystem functions. Preliminary results revealed significant influences of human disturbance and of green areas' spatial configuration on the provision of most ecosystem services. We found both synergies and trade-offs between services, e.g. synergy between plant biodiversity and pollination, trade-offs between biodiversity and the accessibility and usability of green spaces. However, the provision of most services declined under high urban pressure. Specifically, we found that larger and less fragmented green areas provided higher levels of ecosystem services. In contrast, green areas characterized by greater imperviousness, isolation, and shape complexity were associated with lower levels of ecosystem services.
Overall, these findings emphasise the importance of preserving and strategically planning larger and well-connected urban green areas in order to ensure the continued delivery of vital ecosystem services in cities.

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DWARF-SHRUBS EFFECTS ON COMPOSITION AND DIVERSITY OF PLANT COMMUNITIES IN COASTAL HABITATS IN SARDINIA

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Keywords: biodiversity, microhabitat diversity, species coexistence, harsh environments, Mediterranean

The composition and diversity of natural plant communities are shaped by a complex network of interacting abiotic and biotic processes [1-4]. The success of plant establishment and survival is acutely dependent on micro-habitat structure and environmental conditions, with heightened sensitivity in Mediterranean harsh environments [5-6]. Knowledge of the ecological role of aromatic dwarf-shrubs canopy in Mediterranean harsh habitats is useful to manage vegetation dynamics and address habitat restoration [1, 5-7].

From April to July 2023, we studied three model species (*Helichrysum italicum* (Roth) G.Don subsp. *tyrrhenicum* (Bacch., Brullo & Giusso) Herrando, J.M.Blanco, L.Sáez & Galbany, *Teucrium capitatum* L. subsp. *capitatum*, and *Salvia rosmarinus* Spenn.) to assess the effect of aromatic dwarf-shrub canopies on plant community richness and composition in a Mediterranean coastal habitat mosaic constituted by herb and garrigue communities; we examined each species at three different sites in North-Western Sardinia (Italy). For each species-site combination, through point transects method, ten individuals were randomly sampled to assess/evaluate the presence or the absence of vascular plants beneath the dwarf-shrubs' canopies and in their nearby open areas.

Statistical analyses demonstrated that aromatic dwarf-shrub canopies significantly altered plant community composition compared to adjacent open areas across three model species. However, species richness remained unaffected by canopy presence. Beta dispersion, a measure of community variability, was significantly influenced by all three shrub species, while the main community composition varied specifically under *H. italicum* subsp. *tyrrhenicum* and *T. capitatum* subsp. *capitatum* canopies. These findings indicate that the presence of dwarf-shrub canopies creates distinct micro-habitats that drive differences in species composition, suggesting a canopy-mediated influence on plant diversity. Furthermore, significant variations in species richness, main composition, and beta dispersion were observed among the canopies of the three model species. This suggests that the dominant shrub species themselves play a crucial role in shaping the plant diversity within their respective micro-habitats, showing that not all dwarf shrub canopies have the same effect.

We predict that the dynamics of biocoenoses and plant-plant interactions in Mediterranean harsh environments, could be more strongly modulated by plant specialized metabolites in soil and plant parts of aromatic dwarf-shrubs, rather than by the simple shading effects of the canopies themselves.

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POSTERS SESSIONS

POSTERS SESSION 1

Habitat monitoring, management and restoration

1.1. RESURVEYDUNE PROJECT: ASSESSING COASTAL DUNE CHANGES IN THE SAN ROSSORE ESTATE AND CALAMBRONE (TUSCANY, ITALY)

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Keywords: Habitats Directive, habitat and species monitoring, resurvey, vegetation-plot database

In 2023, a call for collaboration was sent to vegetation experts of the Italian Society of Vegetation Science (SISV) to join the ReSurveyDune project, aimed at resurveying Italian coastal dune areas [1]. In line with this objective, the present study resurveyed two coastal areas in northern Tuscany (Italy), within the province of Pisa. The first is located inside the Migliarino – San Rossore – Massaciuccoli Regional Park and includes a 12 km stretch of coastline between the Serchio River to the north and the Arno River to the south. The second area corresponds to the 3.5 km Calambrone coastline, which lies adjacent to the park and is subject to regulatory constraints. It is situated between Tirrenia and the mouth of the Scolmatore d'Arno. While the San Rossore coastline is closed to the public and severely threatened by coastal erosion, the Calambrone coastline is characterized by numerous bathing establishments and remains relatively stable [2].

In spring 2024, we resurveyed 23 historical plots in San Rossore [3] and 28 in Calambrone [4], following the same methodology used for the historical plots, namely the Braun-Blanquet phytosociological method. The presence of all vascular plant species was recorded, and species abundance was visually estimated using the Braun-Blanquet percentage cover scale. Each relevé was assigned to a specific EU habitat type, as defined by the 92/43/EEC Habitats Directive, focusing on the following herbaceous habitats: 1210, 2110, 2120, 2210, and 2230. To analyze shifts in species richness and diversity over time, we calculated Hill numbers (the exponential of Shannon diversity and the inverse of Simpson diversity) for each habitat. Differences between habitats were assessed using the Wilcoxon rank sum test. Additionally, rank-abundance curves were constructed to illustrate the relative abundance of species within each habitat, allowing for temporal comparisons.

The resurvey revealed three key findings: (i) Species richness declined along the San Rossore coastline but showed a slight increase in Calambrone. (ii) The number of historical plots decreased, particularly for habitat 1210 (annual vegetation of drift lines), which disappeared in Calambrone and was reduced by half in San Rossore. (iii) While the dominant species in each habitat remained the same, their overall abundance significantly declined. In conclusion, the study highlights an ongoing regression and fragmentation of dune habitats in both areas, driven by different threats: coastal erosion in San Rossore and human disturbance linked to tourism in Calambrone. In both cases, targeted conservation and management measures are urgently needed to mitigate the degradation of these environments, preserve biodiversity, and ensure the long-term sustainability of these coastal areas.

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1.2. BRIDGING PAST AND PRESENT: INTEGRATING RESURVEY DATA WITH LANDSAT TIME SERIES FOR ENHANCED VEGETATION CHANGE DETECTION IN ITALIAN COASTAL DUNES

Cini E.[1], Marzialetti F.[2,20], Acosta A.T.R.[1], Sarmati, S.[1], Malavasi M.[3,20], Allevato E.[4], Angiolini C.[5,20], Bagella S.[3,20], Bazan G.[6], Bertacchi A.[7], Brancaleoni L.[8], Buffa G.[9], Del Vecchio S.[10], Calbi M.[11], Caria M.C.[3,20], Ciccarelli D.[12], Cutini M.[1], de Francesco M.C.[13], De Natale A.[4], Di Biase L.[1], Fantinato E.[9], Fiaschi T.[5], Gangale C.[14], Gerdol R.[15], Gianguzzi L.[20], Laface V.L.A.[16], Maccherini S.[5,20], Morabito A.[16], Mugnai M.[11], Musarella C.M.[16], Pafumi E.[5,20], Santangelo A.[4], Sciandrello S.[17], Siccardi E.[11], Spampinato G.[16], Stanisci A.[13], Strumia S.[18], Viciani D.[11], Perrone M.[19]

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Keywords: coastal dune ecosystems, historical vegetation resurveys, long-term changes, remote Sensing

Coastal dune ecosystems, among the most threatened habitats in Italy and Europe, host highly specialized plant communities shaped by strong environmental gradients (1). While historical vegetation resurvey data allow for the assessment of changes between discrete time points, they provide no insight into the dynamics occurring in the intervening period (2). The integration of remote sensing, particularly historical Landsat time series, could represent a powerful tool to capture continuous vegetation shifts and enhance our understanding of long-term ecological trajectories. This study explores the relationship between spectral changes and coastal dune habitats, improving our understanding and developing a faster, less labor-intensive monitoring tool. For resurveyed vegetation data we selected 244 plots from the ResurveyDunes database (3) based on size, time and habitat type, classified into three EUNIS habitats: N12 (annual drift vegetation), N14 (shifting dunes), and N16 (dune grasslands). We calculated metrics of change, such as Bray-Curtis dissimilarity, to quantify vegetation changes. For Remote Sensing, Landsat time series data (Landsat 5, 8, 9) were processed in Google Earth Engine, focusing on annual spring "greenest pixel" composites to maximize NDVI. Spectral bands, vegetation indices, and fractional cover estimates were extracted and analyzed with Generalized Linear Models (GLMs) to compare spectral and vegetation changes. Preliminary results from two time points show no significant differences in Bray-Curtis dissimilarity among habitats, but NDVI changes reveal significant productivity shifts in plots transitioning between habitat types, especially from N12 to N14. GLM analyses reveal a significant interaction between NDVI changes and vegetation dissimilarity across EUNIS classes ($p < 0.01$), with dune grasslands (N16) showing a strong negative relationship, indicating that productivity increases where communities remain stable ($p < 0.001$, estimate: -1.367). N12 and N14 show no clear trends, likely due to low vegetation cover. These findings suggest incorporating additional remote sensing variables, with future analyses planned to use the full Landsat time series to better understand long-term coastal dune vegetation changes.

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1.3. SARDU – A SARDINIAN DUNE VEGETATION DATABASE

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Keywords: coastal dune habitat, Habitat Directive, Sardinian coastal dunes

SARDU – SARdinian Dune database is introduced as a comprehensive collection of phytosociological relevés and plots spanning from 1967 to 2025, representing the coastal herbaceous and shrubby dune vegetation of Sardinia. SARDU currently comprises over 1600 vegetation surveys, ranging in size from 1 to 400 m^2, spread along the island's and adjacent islets coastline, with higher concentration in the northern sector of the island.

SARDU includes not only data from the database VegDunes [1-2], but also published and unpublished data collected through habitat monitoring projects and surveys conducted during student internships and thesis projects.

Each record, a full list of vascular plant species with cover estimates, is provided with an identification code, geographic coordinates (with different levels of accuracy), sampling date, plot size, bibliographical reference or survey or name and, if available, phytosociological association. Each plot has been assigned to specific EU dune habitat types as defined by the 92/43/EEC Habitats Directive [3]. Specifically, the habitat types were referred to the codes 1210, 2110, 2120, 2210, 2230, 2240, 2250*, and 2260.

SARDU has been created to help identify data gaps in under-sampled areas and habitats, to contribute to the characterization of Sardinian dune vegetation, to support regional resurvey efforts, to assess temporal vegetation and habitats conservation status changes [4], and to promote targeted conservation and habitat management actions.

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1.4. A COMPARISON OF TWO BRYOPHYTE-DOMINATED EU ANNEX I HABITATS: 7220* AND THE FIRST DOCUMENTED RECORD OF 32A0 IN ITALY

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Keywords: Cratoneurion *rivers, springs, Tufa cascades, Tuscany*

EU habitats 32A0 and 7220* are communities dominated by bryophytes that grow in environments characterized by high humidity and deposition of calcium carbonate, such as moist rock faces and waterfalls [1]. Among them, the occurrence of habitat 32A0 – *Tufa cascades of karstic rivers of the Dinaric Alps* – which was recently included in the last European habitat manual, is not yet reported for Italy [2, 3]. Field surveys conducted between 2023 and 2025 in Tuscany allowed the identification of plant communities which can be attributed to this habitat. According to the Interpretation Manual of European Union Habitats, Habitat 32A0 occurs along stream sections with continuous water flow, where rocky substrates are subjected to strong hydrodynamic pressure [1]. Plant communities pertaining to this habitat consist of pleurocarpous and acrocarpous mosses, and liverworts, which include species such as *Fontinalis antipyretica*, *Apopellia endiviifolia*, *Rhynchostegium riparioides*, and *Palustriella commutata*. In addition to bryophytes, vascular plants and algae may also be present. In comparison, EU Habitat 7220* – *Petrifying springs with tufa formation (Cratoneurion)* – grows on dripping or permanently humid rocky slopes. This latter habitat hosts more stable communities and shows a greater accumulation of calcium carbonate. The study was conducted in 40 sites, covering the major distribution of potential sites in Tuscany, with a total of 80 vegetation relevés of 70 cm × 70 cm. Species cover was recorded, along with environmental and physical parameters including slope, aspect, and an estimate of water flow intensity. Our results confirmed the presence of habitat 32A0 in Italy, highlighting some issues related to the attribution of such communities to this habitat. In particular, issues arise regarding its ongoing conservation, which requires specific measures not yet taken. Moreover, our data demonstrates that habitats 32A0 and 7220* show similarities in terms of species pool but differ in their hydrological constraints. Also, we provided data on their co-occurrence in localized mosaic patterns, which makes field identification particularly challenging. The confirmed presence of habitat 32A0 in Italy highlights the need for a revision of current interpretation systems to improve its identification and future conservation practices. In particular, the conservation of these habitats requires different management strategies: for 32A0, it is crucial to preserve water quality and maintain the natural river regime, meanwhile for 7220* protecting springs and ensuring stable hydrological conditions are more important.

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1.5. PRELIMINARY DATA ON SHRUBLANDS DOMINATED BY *TAMARIX* SPP. IN TUSCANY

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Keywords: Coastal vegetation, Nerio-Tamaricetea, Tamarisk, riparian vegetation

The genus *Tamarix* (Tamaricaceae) comprises 73 taxa originating from Eurasia and Africa, widespread in subtropical, mediterranean, and temperate bioclimatic contexts [1]. In Italy, the genus includes 16 taxa, of which 5 are considered native, and 11 of non-native and unknown origin [2]. In Tuscany 7 taxa occur, of which 4 are native species and 3 alien species. Much of the available floristic data for Tuscany refer to the species *T. africana* and *T. gallica*, mainly in coastal areas [3]. The class *Nerio-Tamaricetea* refers to riparian shrublands and is represented in Italy by the only order *Tamaricetalia africanae*, distributed in the central-southern and Tyrrhenian regions. The order includes the alliances *Tamaricion africanae* and *Rubo ulmifolii-Nerion oleandri*. Communities of *Tamaricion africanae* include hygrophilous and subhalophilous shrublands dominated by *Tamarix* species, developed along intermittent or permanent watercourses with significant flow variations, as well as in coastal wetland areas affected by summer desiccation, in thermo-Mediterranean and meso-Mediterranean bioclimatic contexts [4]. In Tuscany, knowledge of the class *Nerio-Tamaricetea* is limited to shrublands on the Island of Capraia, referred to the endemic association *Festuco corsicae-Nerietum oleandri* [5], alliance *Rubo ulmifolii-Nerion oleandri*, which is the only location in the region as well as the northernmost in Italy for the habitat of Directive 92/43/EEC 92D0 *'Southern riparian galleries and thickets (Nerio-Tamaricetea and Securinegion tinctoriae)*'. Data specifically referring to the alliance *Tamaricion africanae* are not available. During the 2023-2024 period, an initial campaign of vegetation surveys was conducted to assess and characterize shrublands dominated by tamarisks in Tuscany. Forty vegetation surveys were carried out in the provinces of Grosseto, Siena, and Livorno, and three macro-vegetational types dominated by *T. africana* and *T. gallica* were identified, respectively corresponding to subhalophilous coastal shrublands, high fluvial terrace assemblages in inland areas, shrubs in the gullies of clay soils and badland environments. These communities are to be referred to the alliance *Tamaricion africanae*. Some physiognomic combinations, particularly the coastal halophilous and subhalophilous communities, present floristic and physiognomic-structural features that could classify them under the habitat 92D0. This new preliminary data enriches the knowledge of the class *Nerio-Tamaricetea* for Tuscany, confirming the presence of well-defined *Tamarix*-dominated communities. Some of these communities are highly representative and worthy of conservation under the habitat of community interest previously limited to Capraia site in the Tuscan archipelago. This investigation is still ongoing and aims to deepen the knowledge on the characteristics and distribution of these shrub communities, with the additional objective of identifying valuable sites within the region which most deserve measures of protection.

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1.6. EFFECTS OF THE 2025 LAVA FLOW ON THE HABITATS OF MT. ETNA (SICILY)

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Keywords: conservation, Natura 2000 habitats, plant communities, volcanic eruption

Volcanic eruptions are among the most powerful natural forces that shape terrestrial ecosystems influencing the structure, composition, and distribution of the plant communities [1]. Currently, the impacts on plant communities (PCs) and habitats (Hs) are determined by the type of eruption, the chemical properties of the effusive magma and the proximity to the eruption site [1]. High mountain PCs and Hs occurring in the cryoro- and oro-mediterranean bioclimatic belts of Mt. Etna are an example of vegetation that was erased following the eruptive event of February 2025. The eruptive phase of this event began with an effusive activity at the base of the "Bocca Nuova" crater (ca. 3,250 m a.s.l.) and with modest Strombolian activity at the south-east crater [2]. Lava flows for 4.4 km crossing the so called "pista altomontana" until it reaches relatively low altitudes (ca. 1,850 m a.s.l.). The whole area covered by lava flows is about 9×10^5 m². Our study aims at identifying the PCs/Hs that disappeared or were affected by the eruptive event by examining the ratio between the area of PC/H lost and that currently existing on Mt. Etna. In addition, our research allows us to have more quantitative and reliable data on the habitats listed in the European Red List of Habitats [3] that are unceasingly influenced by the volcanic activity of Etna. In particular, the affected plant communities are mostly falling within the N2K Habitats "4090 *Endemic oro-Mediterranean heaths with gorse"* and "9530* *(Sub-)Mediterranean pine forests with endemic black pines"*. Finally, a statistical analysis is carried out to determine the correlations between the characteristics of the lava flows and the affected phytocoenoses to estimate the potential destructiveness of past or future volcanic events.

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1.7. CHASMOPHYTIC COMMUNITIES ON THE COASTAL CLIFFS OF MT. ETNA

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Keywords: conservation, phytosociology, rocky habitats, volcanic cliffs

Sicily is the largest island of the Mediterranean basin. The geological diversity, the complex orogeny and the climatic conditions, together with the long lasting anthropic activities, favored an extraordinary habitat richness. In particular, the coastal cliff habitats preserve many rare and/or endemic species, with a circumscribed geographic distribution and ecological specialization [1]. This habitat is characterized by rupicolous species, belonging to the *Dianthion rupicolae* Brullo & Marcenò 1979, an alliance gathering the Mediterranean chasmophytic communities of southern Italy and Sicily [2]. The coastal rocky cliffs of Mt. Etna host *Dianthus rupicola*, an endemic species to S Italy and Sicily, included in Annexes II and IV of the Habitat Directive and Appendix I of the Bern Convention. The floristic composition of this habitat was defined through phytosociological analyses and compared with other similar vegetation communities of other coastal areas of Sicily. Our study is aiming at (1) delimiting the *Dianthus rupicola* populations along the Ionian coast of Mt. Etna, (2) analysing structure, composition, and demographic trends of the habitat 8210 (*Calcareous rocky slopes with chasmophytic vegetation*), and finally, (3) to provide more insights on the ecology of *Dianthus rupicola* for implementing more effective conservation measures.

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1.8. MONITORING DISTURBED HABITAT USING UAVS: THE CASE OF HABITAT AFFECTED BY THE PRESENCE OF XYLELLA FASTIDIOSA SUBSP. MULTIPLEX IN MONTE ARGENTARIO (GR, ITALY)

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Keywords: habitat monitoring, plant diseases, remote sensing, vegetation science

The study focuses on monitoring habitats impacted by disturbances, with the goal of assessing the conservation of plant communities. The spread of *Xylella fastidiosa* subsp. *multiplex* phylotype ST87 (XfmST87) poses a significant threat to Mediterranean ecosystems, with potential impact on plant biodiversity and habitat conservation [1]. This study examines the impact of the pathogen on vegetation in the 5330, 6220*, and 9340 habitats of Monte Argentario through a diachronic monitoring process from 2021 to 2025. The research combines ground surveys and drone-based remote sensing, using UAV technology and photogrammetry (Fig. 1). The plant's coverage data and phytosociological traits in plant community have been compared by multivariate analysis. The study area was selected for its representativeness and investigated through the analysis of the vegetation identified within permanent plots inserted in the three habitats. Particular attention has been given to the species *Spartium junceum* L., *Cytisus laniger* DC., and *Rhamnus alaternus* L., identified as "targets" due to their spread and susceptibility to XfmST87 infections. The analysis aims to assess the ability of the plant communities to respond to disturbance factors in terms of resistance and resilience. At this stage of the research, no evident impacts have been observed on the plant communities or on the spread of the three target species. The study provides useful information on the possible levels of resistance and resilience of these habitats and emphasizes the effectiveness of UAV technologies for environmental monitoring in areas which are difficult to access due to steep slopes, dense vegetation and uneven terrain.

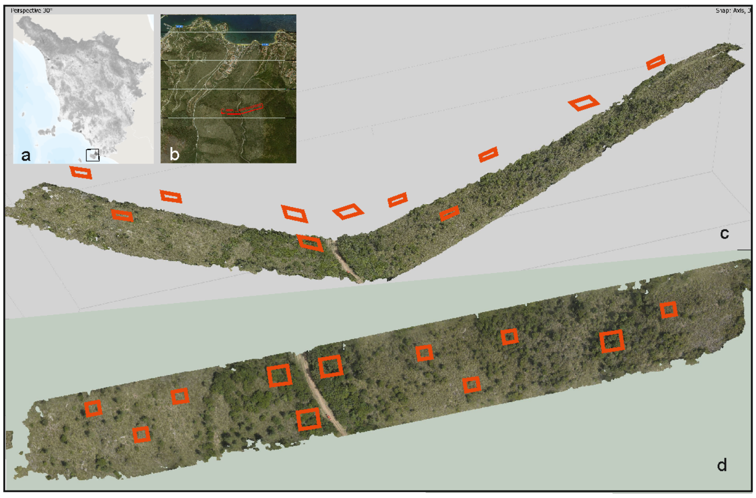

Figure 1. Geographical location of study area (a,b), 3D model with aereal shots (c) and orthophoto (d) with sampling plots.

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1.9. DEEP LEARNING FOR HABITAT MAPPING: EXPLORING ITALIAN COASTAL DUNES

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Keywords: convolutional neural networks, EUNIS habitats, remote sensing, RGB imagery

Coastal dunes host diverse and vulnerable habitats within limited areas, requiring effective monitoring tools [1]. While satellites provide quantitative data, the limited spatial and spectral detail of available imagery hinders broad-scale uses [2]. Convolutional neural networks (CNNs), integrating spatial and spectral features, emerge as a promising approach [3]. Thus, the aim of this study is to assess whether CNN-based methods can provide a solution for habitat mapping on coastal dunes at a broad national scale, using freely available RGB imagery from Google Earth and ground truth data from three EUNIS habitats (N14, N16, N1B). A pilot study was conducted in Collelungo (Tuscany, Italy). Ground truth data were collected in 2024 using 4 m^2 squared plots, which were assigned to EUNIS habitats applying the EUNIS Expert System. An RGB image for the site was acquired from Google Earth with a spatial resolution of 0.2 m. To optimize the CNN, multiple U-Net configurations were tested, varying parameters such as the number of layers, filters, and kernel size. Different combinations of input variables were also assessed: the RGB image, a digital surface model, distance from the shoreline, and a NIR band from a regional orthophoto. Performances were compared in terms of loss, precision, recall and F-Score. To assess the transferability of the method, additional ground truth data were collected from sites distributed across eight Italian regions, representing broader habitat variability. For each site, one RGB image was selected from Google Earth with a date as close as possible to the field sampling period and the best-performing model from the pilot study was applied.

Preliminary results suggest the potential of CNNs for supporting large-scale mapping of coastal dune habitats using freely available remote sensing data, contributing to the monitoring and conservation of these fragile ecosystems.

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1.10. TOWARDS SUSTAINABLE POND MANAGEMENT: INSIGHTS FROM VEGETATION DATA COLLECTION, EAST BAY PARKS, CALIFORNIA

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Keywords: Characeae, livestock ponds, plant sociology, restoration, sustainability

Research on ponds, pools, and puddles raises awareness about these vital freshwater ecosystems, highlighting their ecological importance. These habitats, widespread yet often overlooked, support a high level of biodiversity, comparable to rivers and host rare species, including wetland flora and fauna [2]. Despite their importance, only in recent years efforts in research on them are rising [3].

To deepen the knowledge of ponds in landscapes where water is often unseen, like pastoral system, we conducted vegetation data collection in some parks of East Bay Park, California, USA on 40 livestock ponds, resulting in 150 plots. Most of the ponds were created or restored by Alameda County Resource Conservation District (ACRCD), in the framework of the Wildlife Friendly Ponds project [4], which aims to create or restore ponds for wildlife and cattle, aiding biodiversity, and drought resilience.

The main objective was to analyze the collected data to identify the main features of plant communities and characteristic species, evaluate plant diversity and determine any significant ecological associations. Pale spike rush (*Eleocharis macrostachya*), Cattail marshes (*Typha angustifolia*, *T. latifolia*), Iris-leaf rush seeps (*Juncus xiphioides*)) and Pondweed mats (*Stuckenia pectinata* - *Potamogeton* sp.pl.) characterize herbaceous vegetation alliances of the 40 livestock ponds surveyed. From this fieldwork effort, we have described plant associations dominated by *Chara* sp. pl., previously undocumented or not in depth studied in California.

We are also examining the physical and chemical features of ponds, covering aspects such as size, shape, depth and hydrology, to better understand how to properly manage ponds and pond flora and wildlife, targeting conservation measures.

East Bay livestock ponds support unexpectedly rich plant assemblages, underscoring their ecological value. Adaptive nutrient management, seasonal water-level control, and habitat heterogeneity are critical to sustain their biodiversity and resilience.

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1.11. Monitoring Long-Term Biodiversity Changes in Salt Marsh Habitats

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Keywords: diachronic analysis, resurveying studies, salt marsh vegetation, vegetation re-sampling

Salt marshes are among the least-studied ecosystems in coastal landscapes and have experienced substantial degradation due to agriculture, urbanization, and land reclamation [1]. In the Mediterranean region, these habitats are particularly impacted by habitat fragmentation, invasive species, and urban development [2]. Many salt marsh communities are listed in the EU Habitats Directive (92/43/EEC), emphasizing their conservation importance.

Mediterranean salt marshes typically host low-growing, stress-tolerant plant communities, often forming monospecific stands [3]. These communities are structured along environmental gradients such as salinity, soil oxygenation, flooding, and microtopography, leading to distinct but dynamic zonation patterns.

Despite the growing use of resurvey studies to assess long-term vegetation changes, salt marshes remain underrepresented. To address this, we resurveyed 118 phytosociological relevés first sampled 30 years ago in several coastal wetlands of the Latium region (central Italy), most of which are currently under different levels of protection. Resurveying was performed with the same approach as for the historical plots, during the same season and with the same plot size. The occurrence of all vascular plant species was recorded, and species abundance was visually estimated using the Braun-Blanquet percentage cover scale, as in historical plots. Here, we present preliminary results on changes in species composition, richness, and diversity using ordination techniques (DCA) and diversity indices. We also explored changes in key ecological groups (typical, ruderal, and alien species) and performed SIMPER analysis to identify species contributing most to compositional shifts.

Our initial findings reveal a general increase in species diversity, partially driven by the spread of alien and generalist species, reflecting ongoing environmental and anthropogenic pressures.

These results highlight significant ecological transformations and the need to deepen our understanding of salt marsh dynamics to address future conservation and restoration efforts.

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1.12. *EX-SITU* APPROACHES FOR EFFECTIVE CONSERVATION AND RESTORATION OF PRIORITY HABITATS: OPTIMIZATION OF GERMINATION PROTOCOLS OF KEY SPECIES

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Keywords: ecosystem restoration, habitat conservation, seed germination, vegetation science

The restoration and reinforcement of degraded habitats is a crucial strategy for halting biodiversity loss and enhancing ecosystem resilience [1]. *Ex-situ* conservation approaches, particularly the development and optimization of germination protocols, play a critical role in supporting *in-situ* conservation and restoration efforts [2,3].

This study focuses on characterizing the germination behavior of plant species associated with priority habitats in the Valencian Community, by evaluating key environmental variables such as temperature, salinity, and water availability in order to identify species-specific requirements that significantly enhance germination success. The main objective is to provide applied knowledge for the development of controlled propagation protocols and seed banking strategies, thereby contributing to the *ex-situ* conservation of threatened or ecologically significant species. This approach is particularly relevant in the current context of habitat loss and climate change, where ecological restoration efforts require solid, long-term scientific foundations.

We analyze the germination response of species such as *Pancratium maritimum* and *Malcolmia littorea*, linked to Mediterranean coastal dune systems (habitat 2120*); *Teucrium lepicephalum*, *Thymus moroderi* and *Gypsophila struthium*, associated with Iberian gypsum vegetation, *Gypsophiletalia* (habitat 1520*); *Marsilea strigosa* and *Eleocharis palustris*, from Mediterranean temporary ponds (habitat 3170*); *Pteris vittata*, *Adiantum capillus-veneris* or *Pinguicula* sp. pl., typical of humid rocky environments included in Petrifying springs with tufa formation (habitat 7220*); *Halocnemum strobilaceum* and *Halopeplis amplexicaulis*, found in salt marshes and inland saline habitats (habitats 1510* and 1420); and *Helianthemum caput-felis*, a coastal endemic from Thermomediterranean scrub and cliff habitats (habitat 1240*); *Silene diclinis* and *Fritillaria hispanica*, from Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea* (habitat 6220*); *Cladium mariscus* growing in Calcareous fens and species of the *Caricion davallianae* (habitat 7210*); *Paeonia officinalis* and *Aquilegia vulgaris* from *Tilio-Acerion* forests of slopes, screes and ravines (habitat 9180*), among many others. This work compiles results obtained over more than 25 years of research by our team.

As an outcome, we report the seed dormancy levels of the studied species according to their associated priority habitats, providing valuable data for conservation planning and management.

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1.13. LIFE19 IPE/IT/000015: RESTORATION OF HABITAT 7230 - *LOW ALKALINE FENS* IN THE COLFIORITO MARSH. RESULTS OF THE SECOND YEAR OF REPLANTING ACTIVITIES

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Keywords: Habitat EEC 7230, habitat restoration, Natura 2000 network

This presentation illustrates the methodologies and 2025 ongoing results of the second phase of the restoration and improvement activities of the habitat 7230 “Alkaline fens” within the LIFE19 IPE/IT/000015 - LIFE IMAGINE project.

The Palude di Colfiorito (Natura 2000 site code SAC/SPA IT5210072) has undergone significant vegetation changes in recent decades. These changes are mainly due to the abandonment of traditional mowing practices and the invasion of *Phragmites australis* (Cav.) Trin. ex Steud., *Deschampsia cespitosa* (L.) P. Beauv. and *Rhamnus cathartica* L., which have severely altered the vegetation structure of the habitat 7230.

The LIFE IMAGINE project (2020–2027), is part of the LIFE Programme for Environment and Climate Action. The restoration actions of habitat 7230 (actions A.9 - C.12) are carried out in collaboration with the Department of Chemistry, Biology and Biotechnology of the University of Perugia (DCBB), the Umbria Region and the Regional Agency for Forests (AFOR).

The first three years of fieldwork, focused on land preparation starting from 2022, were presented at the previous 57th SISV congress in Venice [1].

The long-term objective of this intervention is the complete restoration of habitat 7230 in the Palude di Colfiorito. The short-term objective is the recovery of *Eriophorum latifolium* Hoppe (target species) populations in the areas where this species had disappeared. This is done using a patch strategy, concentrating efforts on selected plots that will later serve as nuclei for population expansion.

Historical data [2] show the presence of the following phytosociological associations in the area during the period 1967-1973: *Scheuchzerio-Caricetea* fuscae R. Tüxen 1937; *Caricetalia davallianae* Klika 1934; *Caricion davallianae* Klika 1934; with groupements with *Eriophorum latifolium*, *Carex panicea* L. and *Juncus subnodulosus* Schrank.

The replanting activity involved the transplantation of *Eriophorum latifolium* individuals grown for at least three years, allowing the development of stolons and flowering scapes. The initial planting was carried out with a density of one tuft per square meter on six plots of 5x5 meters.

Environmental parameters monitored during the multi-year project include air temperature, precipitation and groundwater level, measured by five piezometric tubes.

Following the replanting phase of *Eriophorum latifolium*, further actions will be undertaken to control the spread of *Phragmites australis* and to promote the growth of characteristic species of *Caricion davallianae*, currently grown under controlled conditions.

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2) Pedrotti F. 2019 - Les Cahiers de Braun-Blanquetia Monographies de cartographie géobotanique, 2:1-118

1.14. RESURVEYING ALPINE GRASSLANDS IN THE MONTI SIBILLINI NATIONAL PARK (CENTRAL APENNINES, ITALY)

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Keywords: alpine belt, habitat, resurvey

Alpine ecosystems are considered important hotspots for biodiversity, yet they are among the most susceptible to climate and land-use change and biodiversity loss [1]. Alpine grasslands, in particular, host a complex mosaic of highly specialized communities rich in endemic and rare plants and represent areas of prime conservation value [2, 3]. Changes in structure and composition of ecosystems can severely affect their functioning and the services that they provide, underlining the importance of monitoring ecosystems [4].

Our aim is to track long-term changes in biodiversity and assess environmental change over more than 20 years by resurveying historical vegetation plots originally sampled in the Sibillini Mountains. This research's main target vegetation includes *Sesleria* sp.pl. and *Carex* sp.pl.-dominated communities, includable in the phytosociological class *Elyno-Seslerietea* Br.-Bl. 1948. The selected plant communities are also listed in the 92/43/EEC Habitats Directive as Habitat 6170 - Alpine and subalpine calcareous grasslands.

We expect to observe significant changes in community structure and composition and a general decrease in the abundance of cold-adapted and specialized species, as well as a shift of warm-adapted generalist species, due to the thermophilization and land-use change processes affecting European mountain summits [5, 6].

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6) Bonari G., Bricca A., Tomasi G., Dorigatti L., Bertolli A., Andreatta D. et al. 2025. Grassland Changes in the Eastern Alps Over Four Decades: Unveiling Patterns Along an Elevation Gradient. *Applied Vegetation Science*, 28: e70012.

POSTERS SESSION 2

Functional traits and Diversity in plant communities

2.1. iMAD: A NATIONAL PROJECT AIMED AT UPDATING ECOLOGICAL-FUNCTIONAL KNOWLEDGE ON MACROPHYTES IN ITALY

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Keywords: aquatic plants, conservation strategies, eco-functional niches, invasive macrophytes, spatial patterns

Macrophytes are one of the biological components at greatest risk of (local/regional) disappearance in Italy, as is much of the freshwater biodiversity of central and southern Europe [1]. At the same time, Italy represents a hot spot of floristic and vegetation diversity of considerable importance in the global context [2]. Unfortunately, the level of knowledge about this fundamental biological component is overall inadequate for planning appropriate protection and management initiatives [3,4]. To remedy this situation, the iMAD (development of the Italian MAcrophytes Database) project – funded by the Italian National Biodiversity Future Center – was launched in late 2024 as part of the implementation of the National Recovery and Resilience Plan (PNRR) of the program Next Generation EU. iMAD has three main objectives: 1. to update the available knowledge on macrophytes in Italy by reviewing the data edited by Bolpagni et al. [5]; 2. to collect and systematise ecological and vegetation data on macrophyte-colonised ecosystems, to be associated 3. with functional data for some target macrophyte species. In general, therefore, the iMAD project will enable significant implementation of Italian biodiversity databases, creating a new database specifically dedicated to "macrophytes" (iMAD). A large amount of data, both distributional and ecological-functional, will be collected during 2025. For the 10 most widespread (native) macrophytes and the 10 invasive macrophytes recognised as most critical at the national scale, environmental and functional niches will be defined – exploring the spectrum of leaf economics – by investigating at least 10 different populations each. Finally, special attention will be paid to rare and/or threatened macrophytes, for which environmental determinants will be characterised, both in terms of water and sediment physical-chemical quality and risk and impact factors. Initial evidence gathered on the vegetation features will be presented.

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2.2. PASTORAL VALUE: RECENT ADVANCES AND FUTURE PERSPECTIVES

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Keywords: database, grasslands, specific indices

The Pastoral Value (PV), introduced by Daget and Poissonet [1], assigns a dimensionless index ranging from 0 to 100 to grasslands, facilitating the assessment of their sustainable carrying capacity. Calculating this index requires knowledge of the cover of each species, expressed as the Specific Contribution to the Presence (CSP) within the grassland canopy and its Specific Index (SI), which synthesizes various agronomic and biological attributes, including productivity, nutritional value, palatability, digestibility, and tolerance to grazing. However, the value of SI can vary depending on the environment in which the plant is found and the type of grazing animals. Therefore, for each species, it is often necessary to know the different SI values it may assume in various contexts.
Roggero et al. [2] were the first to compile a database of SI values, which has since become a widely adopted reference, supporting broader application of the PV method in grassland assessment. More than 20 years after that initial contribution, the present study sets out with three main objectives: (i) to evaluate the extent and ways in which the PV method has been applied over the past two decades; (ii) to compile an updated database of SI; and (iii) to explore future perspectives for the use of this method in grassland assessment.
We identified 155 scientific articles published from 2002 to 2024 focused on PV. Europe accounts for most of these studies, with 108 in total (including 63 from Italy, 17 from Romania, and 12 from France). Africa follows with 39 studies, while research involving PV in Asia and the Americas is still relatively limited.
After analyzing the general objectives of the reviewed publications, we classified them into seven thematic categories. Two primary purposes emerged: assessing the effects of management on grassland characteristics, and mapping and characterizing grassland types.
Data on SI were reported in 27 reviewed papers, allowing us to expand the original dataset by Roggero et al. [2]. The updated database now includes 2904 species across 125 families. Six families - Asteraceae, Poaceae, Fabaceae, Brassicaceae, Caryophyllaceae, and Lamiaceae - represented by over 100 species. The most frequently cited species were *Lotus corniculatus* L., *Trifolium campestre* Schreb., *Plantago lanceolata* L., *Trifolium pratense* L., and *Dactylis glomerata* L.
Some preliminary trends are emerging from this ongoing review. The PV method has been predominantly applied in a great variety of European and African contexts, underscoring its potential for broader implementation in underrepresented regions. Thanks to its flexibility, the PV method has become a valuable tool for assessing grassland quality and has found application beyond traditional livestock management. It is now also used in ecological conservation, biodiversity monitoring, and natural resource management. These emerging uses reflect shifting priorities within the agricultural and environmental sectors, emphasizing the importance of PV in promoting sustainable land use and supporting informed decision-making in global grassland ecosystem management.

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2.3. DRY GRASSLAND RESTORATION PROJECTS IN THE EUGANEAN HILLS (NORTHERN ITALY)

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Keywords: ecosystem restoration guidelines, habitat monitoring, vegetation science

The conservation of dry calcareous grasslands (habitat 6210), important biodiversity hotspots and historical component of the cultural landscape of Euganean Hills, is dramatically threatened by the decline of traditional sylvo-pastoral activities, the spread of alien flora and fauna, and some recreational activities such as off-road motorcycling and mountain biking [1], However, the most pressing threat is due to their exposure and soil characteristics that make them suitable for growing vines, mainly variety Merlot, Cabernet Franc, Cabernet Sauvignon, and, more recently, the "glera" grapes used in the production of Prosecco and Serprino wines. This conversion occurs despite EU protection.

A pilot conservation project was developed from 2022 to 2024 over an 8-hectare area owned by the Euganean Hills Regional Park. The target site includes degraded patches of the habitat 6210* with scrublands as well as open grasslands in a favourable conservation status. A range of ecosystem restoration actions were carried out, accompanied by a three-year monitoring plan to assess the initial condition of the landscape and evaluate the effectiveness of interventions, performed in different phenological phases and using varied approaches.

The monitoring plan included: 1) Floristic GIS cartography to digitally map the distribution and reproductive fitness of selected species of high conservation value; 2) Phytosociological surveys, vegetation mapping, and conservation status assessment of the patches. Based on this ex-ante monitoring and considering the phenology of priority species (e.g., the flowering period of orchids, breeding of European nightjar), specific timing and methods were selected for intervention.

From 2022 to 2024, in three seasonal periods (April, July, and October), the Regional Agency carried out mechanical clearing and cutting across various scrubland facies. These activities aimed to restore grasslands encroached by *Spartium junceum* and *Cotinus coggygria*, control the invasive *Robinia pseudacacia,* and eliminate a *Fraxinus ornus* thicket. In addition, seeds of the structural species *Bromus erectus* and *Chrysopogon gryllus* were collected from donor open grasslands sites via brush harvesting and sown in autumn to aid grassland regeneration in bare-soil patches created by cutting. At the Botanical Garden of Padua, germination tests on the two grasses assessed seed quality and field performance. In addition, some seeds were also cultivated in the greenhouses, and the resulting young tufts were used in spring to restore the grassland canopy. Currently, the project involves additional dry grassland areas recently bought by the Regional Body, and new target species.

One major problem still remains unsolved: bulbous species - mainly orchids, *Allium* sp. and *Muscari* sp. - are dramatically endangered by wild boars, which dig up and consume the underground organs, destroying entire subpopulations.

In order to increase the awareness of the multifaceted values of this habitat, local authorities, public and private stakeholders have been and will continue to be involved through workshops and seminars.

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POSTERS SESSION 3

Phytosociology and applied Geobotany

3.1. NEW DATA ON THE RIVER ECOSYSTEM VEGETATION PATTERN IN THE MOLISE REGION (CENTRAL-SOUTHERN ITALY)

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Keywords: environmental drivers, macrophytes, Molise region, vascular plants.

River ecosystems host diverse biological communities and for their dynamic and physical conditions are among the most threatened environments by human activities like dams, pollution, and water extraction. EU policies, such as the Habitats Directive and the Water Framework Directive aim to protect and restore river habitats. Floristic and vegetation knowledge is essential for identifying protected habitats, guiding conservation efforts and aiding regional conservation planning. Despite that, the available phytosociological data and syntaxonomic frameworks concerning the river plant communities occurring in the Molise region are currently very low.

This study investigates the vegetation communities along two rivers in the Molise region (central-southern Italy) the Sordo and Biferno Rivers, focusing on their relationship with fluvial geomorphic and hydrological features. The Sordo River, located near Isernia city, is characterized by karstic spring-fed waters and a temperate, humid climate, while the Biferno River spans a mainly Mediterranean bioclimate zone with diverse geological substrates from limestone to clay formations. Vegetation sampling was conducted in spring-summer 2024 using the phytosociological method, resulting in 80 relevés covering 170 species. Multivariate analyses (hierarchical classification and PCA) revealed distinct hygrophilous, hydrophytic and mesophilic clusters strongly correlated with morpho-topographic and hydrological conditions and referred to different vegetation physiognomic types.

The forest potential vegetation was ascribed to two main associations, *Dioscoreo communis-Populetum nigrae* Poldini & Vidali in Poldini, Sburlino et Vidali 2017 and *Rubo ulmifolii-Salicetum albae* Allegrezza, Biondi et Felici 2006. The *Phragmitetum australis* Savič 1926 turned out to be the most common helophytic vegetation type, especially in marshes habitats temporarily dry, whereas *Typhetum latifoliae* Nowiński 1930 and *Bolboschoeno compacti-Scirpetum tabernaemontani* Bueno Sánches et Prieto in Bueno Sánches 1997 occurred on longer-flooded substrates and deeper waters. *Caricetum hispidae* Brullo et Ronsisvalle 1975 was found, restricted to the karst plain of the Sordo River. A rich mosaic composed of several hydrophilic communities belonging to *Batrachion fluitantis* Neuhäusl 1959 and *Potamogetonion* Libbert 1931 characterized both the rivers investigated, as well as some well-known hygrophilous communities, such as *Nasturtietum officinalis* Gilli 1971, *Helosciadietum nodiflori* Maire 1924 and *Glycerio-Sparganietum neglecti* Koch 1926. Different types of humid meadows communities of *Molinio-Arrhenatheretea* R.Tx.1937 and *Epilobietea angustifolii* Tx. et Preising *ex* von Rochow 1951 were found as occupying restricted plots surrounding the rivers, due to the highly variable micro-geomorphological and soil texiture features. The *Phalarido-Petasitetum hybridi* Schwick 1933 was found within the stony edges of the Sordo river in shady conditions, while a vegetation mosaic comprising the *Polygono lapathifolii-Xanthietum italici* Pirola et Rossetti 1974 association, a community dominated by *Polypogon monspeliensis* and *Persicaria lapathifolia,* and stands of *Scirpoides holoshoenus* were found to characterize exposed stretches of pebbled river beds where the river flow rate significantly decreases during summer.

3.2. WEED PLANT COMMUNITIES OF THE VINEYARDS IN CASTILLA-LA MANCHA REGION (CENTRAL SPAIN)

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Keywords: phytosociology, weed vegetation, woody crops

Spain is the country with the largest vineyard area in the world, and Castilla-La Mancha accounts for almost half of this area in the country [1].The latest Common Agricultural Policy (CAP) reform emphasizes the maintenance of biodiversity in agricultural areas and the vegetation cover of woody crops, such as grapevines, which has proven to be a useful tool for reducing soil loss. This work aims to study the natural vegetation cover of vineyards in Castilla-La Mancha (central Spain). The study area is located in Pozoamargo (Cuenca province), in vineyards belonging to the Ribera del Júcar Designation of Origin. The vines are grown on trellises, with drip irrigation and under organic production rules. The territory has been characterized from a geological, bioclimatological, and biogeographical perspective. The study of the flora and plant communities has been carried out through the development of a floristic catalogue, as well as by taking relevés in the territory during the springs of 2023 and 2024 and their subsequent syntaxonomic classification, applying the phytosociological method and the criteria of Rivas Martínez et al. [2, 3], Fernández-González et al. [4] and Mucina et al. [5].

The floristic catalogue is made up of 127 species from 26 different families, with Asteraceae, Brassicaceae, Poaceae and Amaranthaceae standing out for their number of species. The chorological distribution indicates that they are mainly Mediterranean species (52%), followed by those with a Holarctic distribution (31%). As for the life forms, the majority correspond to therophytes (75%), followed by hemicryptophytes (20%). The dominant and more frequent species are the natives *Sisymbrium runcinatum, Lactuca serriola* and *Picnomon acarna;* the naturalized species *Conyza bonariensis* and *Conyza canadensis* as well as the endemism of the Iberian Peninsula, *Diplotaxis virgata.* These communities are related to the alliance *Diplotaxion erucoidis* Br.-Bl. in Br.-Bl. et al. 1936 (*Eragrostietalia* J. Tüxen ex Poli 1966), with floristic influences from *Papaveretalia rhoeadis* Hüppe et Hofmeister ex Theurillat 1995 and *Chenopodietalia* Br.-Bl. in Br.-Bl. et al. 1936.

Plant communities conforming to the spontaneous vineyard cover in Castilla-La Mancha show a rich and diverse flora. These communities can help preserve ecological interactions, such as those between plants and pollinators, improve heterogeneity and connectivity between habitats, reduce the impacts of fragmentation and contribute to the maintenance of ecosystem services.

1) OIVE (Interprofesional del vino de España). (2021). La relevancia económica del sector vitivinícola Castilla-La Mancha.

2) Rivas-Martínez S. et al. 2001. Syntaxonomical checklist of vascular plant communities of Spain and Portugal to association level. *Itinera Geobotanica* 14: 5-341.

3) Rivas-Martínez, S. et al. 2002. Vascular plant communities of Spain and Portugal. *Itinera Geobotanica* 15: 1-922.

4) Fernández-González F. et al. (2012). *Avances en el conocimiento de la Vegetación*: 97-160. Ed. Universidad de Castilla-La Mancha.

5) Mucina L. et al. (2016) Vegetation of Europe: hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algal communities. Appl. Veg. Sci. 19 (Suppl. 1): 3-264.

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3.3. PHYTOSOCIOLOGICAL ANALYSIS OF THE JUNIPER COMMUNITIES OF SCI IT9110015 "DUNA E LAGO DI LESINA – FOCE DEL FORTORE" (APULIA)

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Keywords: Juniperus macrocarpa*,* Juniperus turbinata*, habitat 2250*, vegetation analysis,*

Coastal dune systems provide a wide range of ecosystem services such as, among others, prevention of coastal erosion and protection from extreme events [1]. Nevertheless, the maintenance of coastal dune systems is strictly related to the conservation status of plant species and community types [2]. In many parts of the world, and especially in the Mediterranean area, coastal dune systems are highly threatened with tourist exploitation, coastal erosion, and introduction of alien species among the main drivers of change, and undergo different forms of degradation, such as habitat alteration, reduction and fragmentation [3].

The Natura 2000 site IT9110015 – "Duna e Lago di Lesina-Foce del Fortore" (northern Apulia) is characterized by one of the most extensive coastal dune systems in southern Italy, with an overall coastline extent of about 34 km [4]. Specifically, this contribution focused on the priority habitat type 2250* - "Coastal dunes with *Juniperus* spp.", with the aim of analysing and characterising it in the site from a phytosociological point of view. The data set of this study is part of a wider one of about 150 phytosociological relevés performed from 2015 to 2024 and covering the entire coastal dune system. A sub-set of 48 relevés, with dominant *Juniperus macrocarpa* Sm. and *J. turbinata* Guss., was subjected to multivariate analysis.

The results allowed the detection of different types of *Juniperus* communities, all belonging to the *Asparago orientalis-Juniperion macrocarpae* (Diez Garretas et Asensi 2014) Mucina in Mucina et al. 2016 alliance [5,6], and suggested the distance from the sea, among the analyzed features, influences their distribution, floristic composition, and structure.

Further investigations on soil structure and composition, as well as on the spatial distribution and the contacts between *Juniperus* communities and the others, would be useful to better outline present and future ecological dynamics.

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POSTERS SESSION 4

Free session

4.1. FORESTS OF *TETRACLINIS ARTICULATA* (VAHL) MASTERS IN NORTHWESTERN AFRICA

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Keywords: phytogeography, plant community distribution, vegetation

Understanding plant community ecology and distribution is essential in regions of high biogeographical significance, particularly those rich in endemic species and genera, such as the Mediterranean. Many vegetation types in Southern Europe extend into North Africa [1], while some, like those dominated by *Tetraclinis articulata*, are primarily North African with limited presence in Southern Europe [2]. *Tetraclinis articulata* is a conifer native to the southwestern Mediterranean, predominantly found in Morocco, Algeria, and Tunisia [3], with smaller populations in southeastern Spain and Malta [4]. This study aims to characterize the ecological features of open forest communities dominated by *Tetraclinis articulata* in northwestern Africa.
We assembled a dataset of 1,873 vegetation plots from both published and unpublished sources, including 18 scientific journals and six PhD theses, covering the species' entire distribution range. From these, we selected 695 plots in which *Tetraclinis articulata* had at least 15% cover and retained only those identified as Mediterranean Cupressaceae Forests. The final dataset comprised 545 plots (ranging from 50 to 250 m² in size), associated with approximately 40 different syntaxonomic names referring to *Tetraclinis articulata* communities. Summary statistics revealed an average species richness of 18.2 ± 5.7 species per plot. Mean Ellenberg indicator values were 7.8 ± 0.3 for light, 3.2 ± 0.3 for moisture, 6.3 ± 0.5 for soil reaction, 3.8 ± 0.5 for nutrients, and 8.9 ± 0.4 for temperature. Our preliminary results suggest these open-canopy forests occur in all Northwestern Africa, spanning diverse environmental conditions that support their diversity.
This research will enhance the understanding of the ecological conditions supporting *Tetraclinis articulata* communities and will provide valuable insights for their conservation across the Mediterranean region.

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4.2. ECOLOGICAL UNIQUENESS OF PONDS AS WATER ISLANDS

Cannucci S.[1,2], Bonari G.[1,2], Bolpagni R.[3], Dalla Vecchia A.[3], Fanfarillo E.[1,2], Fiaschi T.[1], Maccherini S.[1,2], Mascia F.[1], Angiolini C.[1,2]

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Keywords: Beta diversity, environmental drivers, LCBD, macrophyte conservation, SCBD

Ponds are considered "island-like" systems due to their isolation within terrestrial landscapes. As part of a connected network (pondscape), they allow species movement between patches and act both as sources and catchment of species [1]. This dynamic contributes to species turnover, which is the main component of macrophyte beta diversity [2]. Analyzing the beta diversity components (turnover and nestedness), reveal the ecological processes behind diversity and the contribution of each site (local contributions to beta diversity, LCBD) and species (species contributions to beta diversity, SCBD) to total beta diversity [3]. With this work we aimed to explore how ponds mirror the ecological characteristics and dynamics commonly associated with islands. Specifically, our objectives were to: (i) quantify pond isolation by assessing beta diversity of macrophyte communities in permanent farmland ponds, analyzing both its turnover and nestedness components, and determine LCBDand SCBD; (ii) investigate macrophyte composition in relation to environmental factors (physicochemical,climatic and spatial) and identify the key drivers influencing LCBD; and (iii) examine the relationship between SCBD values and species frequency, while determining which ecological group (non-emergent hydrophytes or wetland emergent rooted plants) contributes most to beta diversity.
We conducted our study in 115 permanent farmland ponds across three regions of Italy (Sardinia, Tuscany, and Emilia-Romagna), under varying agricultural land-use extents. A total of 345 vegetation plots were surveyed, with data collected on macrophyte cover and water physicochemical parameters. Our findings indicate that overall beta diversity is predominantly driven by species turnover and that certain sites contribute more than others to total beta diversity. Water depth, dissolved oxygen, turbidity, annual precipitation amount, annual range of monthly potential evapotranspiration and the space component were the main drivers of macrophyte composition, while LCBD values were negatively influenced by turbidity. Species with the highest SCBD values were also the most frequent, and non-emergent hydrophytes emerged as the ecological group contributing most to beta diversity. Our results highlight that macrophyte diversity is shaped by local (pond-specific) factors and that for plant conservation purposes, it is important to provide pond-level conservation efforts in addition to protecting entire pondscapes.
This underscores the need for a holistic approach when developing conservation strategies for biodiversity in permanent ponds.

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4.3. The vegetation of the terraces along the Alta Via del Tabacco

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Keywords: habitat 6110, masiere (dry-stone walls), terraced landscape*

The protection of terraced landscapes deserves special attention for their historical and landscape value, biodiversity, and for mitigating hydrogeological risk. This work aims to contribute to the knowledge of their flora and vegetation.

In the Veneto region, between the *Altopiano dei Sette Comuni* (Asiago Plateau) and Mount Grappa, the Brenta River flows. For about 30 km, mainly on the orographic right, on the side of the plateau, terraces with dry-stone walls up to 8 meters high extend. Tobacco cultivation was introduced in these terraces from the second half of the 17th century and became dominant in the second half of the 19th century. The development of mechanization and the limited accessibility within this terraced area contribute to the decline in agricultural competitiveness [1]. The study area lies between 200 and 600 meters above sea level and is characterized by dolomitic and grey limestone substrates. The climate corresponds to the supratemperate thermotype and the humid to hyperhumid ombrotype. The forest vegetation on adjacent slopes is classified as *Buglossoido purpurocaeruleae-Ostryetum carpinifoliae Gerdol, Lausi, Piccoli et Poldini 1982* [2]. Biogeographically, the area belongs to the Eastern Sector of the Alpine Province [3]. This biogeographical setting is highlighted by certain distinctive species such as *Moltkia suffruticosa* subsp. *suffruticosa*, *Campanula carnica*, *Salvia saccardiana*, *Moehringia bavarica* subsp. *bavarica*, with an Illyrian influence also indicated by species such as *Genista sericea*, *Seseli gouanii*, and *Euphorbia triflora* subsp. *kerneri*. A comparison with surveys unpublished carried out more than ten years ago reveals a decrease in species that are more closely tied to bright environments, such as *Linum narbonense*, *Anthyllis vulneraria* subsp. *polyphylla*, and *Hypochoeris maculata*. The vegetation analysis on the terraces and on the dry-stone walls was conducted through point relevés, randomly distributed within the survey area, after cartographic evaluation. For grassland vegetation, 41 relevés of 4 m^2 each were performed, recording species presence and estimating their cover. For dry-stone walls, 90 relevés of 1 m^2 each were conducted using the same methods. The vegetation analysis highlights that three types of grassland established on the terraces under different ecological conditions, dominated by different species: *Arrhenatherum elatius*, *Festuca rupicola*, *Brachypodium rupestre*, and locally *Thymus pulegioides*. The area is also affected by episodes of surface runoff, evidenced by the presence of communities assignable to *Gladiolo palustris-Molinietum arundinaceae* Poldini et Feoli Chiappella in Feoli Chiappella et Poldini 1993. While the plant communities within the former cultivated fields have not yet reached a noteworthy level of stability, indicated by the presence of species such as *Papaver rhoeas*, *Erigeron annuus*, and other species associated with anthropogenic disturbance, the vegetation distribution on the dry-stone walls is very clear: vertical faces predominantly host communities referable to *Asplenietum rutae-murario-trichomanis* Tüxen 1937 with abundant *Ceterach officinarum*, alternating with communities linked to *Alysso alyssoidis-Sedetum albi* Oberd. *et* Th. Müller in Müller 1961 (Habitat 6110*). Extensive populations of *Sedum sexangulare* occur in the upper sections on horizontal surfaces.

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4.4. PERMANENT GRASSLANDS OF THE MIDDLE BRENTA

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Keywords: biodiversity, cattle farming, hay meadows resurgences, sustainability

In the resurgence belt along the middle course of the Brenta River, lowland permanent grasslands have developed, constituting a landscape of notable historical and ecological value. These grasslands cover an extensive area [1], which remains well preserved [2]. Their existence is closely linked to the introduction of agricultural and livestock management practices brought in during the late 19th century by families migrating from the *Altopiano dei Sette Comuni*. This study aims to collect data to evaluate the ecosystem services provided by these grasslands, with a focus on productivity, forage quality, and biodiversity. A land-use map was created for an area of approximately 93 km² and sixty-five phytosociological relevés of 100 m² were conducted and then classified. In randomly selected subsamples, the density of entomophilous plant inflorescences was recorded per square meter. More than 60% of the study area is covered by permanent grasslands. Classification revealed two distinct vegetation groups: one corresponding to the *Poo sylvicolae-Lolietum multiflori* Poldini & Oriolo 1994 association, and the other representing a therophyte-rich variant, dominated by *Alopecurus myosuroides* and *Avena sterilis subsp. ludoviciana*. Rare but ecologically significant species, such as Centaurea nigrescens, were also recorded. Comparison with the soil map [3] and the irrigation channel network [4] revealed that the typical *Poo-Lolietum* association occurs on better-drained but more intensively irrigated soils. Due to frequent mowing (five to six cuts per year), a high diversity of entomophilous species is promoted, including *Trifolium pratense*, *T. repens*, *Crepis vesicaria*, and *Taraxacum sect. Ruderalia*. Average inflorescence density increased from 3 per m² before the first cut to 32 per m² after. Unlike cultivated agricultural fields, which require intensive use of herbicides, pesticides, and synthetic fertilizers, permanent grasslands are managed exclusively through organic fertilization, irrigation, and mowing. This management approach helps reduce water and soil pollution and preserve air quality. Surface irrigation also supports groundwater recharge, sustains the resurgence system and promotes the leaching of organic slurry used for fertilization [5]. Furthermore, this irrigation method contributes to the development of high-value habitats for wild bird species, including the white stork, great egret, cattle egret, hen harrier, and various passerines. Interviews with local livestock farmers revealed a slight decrease in grassland productivity in recent years, potentially due to climate change or excessive mowing frequency, which was traditionally limited to four annual cuts. Other contributing factors may include soil compaction from increasingly heavy agricultural machinery and changes in irrigation practices, particularly the transition from surface irrigation to sprinkler systems.

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4.5. Eradication and Control of *Cenchrus setaceus* (Forssk.) Morrone in Calabria (Italy): A Project for Vegetation Conservation

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Keywords: alien species, distribution, diversity, MaxEnt, Poaceae

Calabria is currently facing a concerning and aggressive biological invasion caused by *Cenchrus setaceus* (Forssk.) Morrone (Poaceae). Originating from distant regions such as the Middle East, the Arabian Peninsula, and North Africa, this alien herbaceous species is exhibiting a rapid and relentless expansion across the Italian territory, establishing itself as a serious and growing threat to the delicate integrity of Mediterranean ecosystems [1]. Its uncontrolled spread is leading to a profound alteration of the native floristic composition, exerting strong competition for vital resources to the detriment of native species and causing a drastic reduction in biodiversity [2, 3]. Recent research, such as that by Musarella et al. [4], underscores its potent competitive impact in xeric environments, while in Sicily, the speed and alarming extent of its colonization have been clearly documented by Pasta et al. [5]. This research project aims to conduct a detailed analysis of the invaded vegetation in Calabria, establishing a critical comparison with other severely affected areas, such as Monte Pellegrino in Sicily [6] or the Algarve in Portugal [7], to fully comprehend the severity of the ecological consequences resulting from this unstoppable invasive advance.

The primary objective of this research project is to urgently counteract the further propagation of this highly invasive species, implementing targeted and effective strategies for the eradication of established populations. Simultaneously, it proposes to accurately map the current and potential distribution of the compromised vegetation in Calabria using MaxEnt software. A further crucial objective is the development of rigorous management guidelines and the wide dissemination of research results, with the intent of actively sensitizing and informing stakeholders and the public about the serious and urgent problems connected to this devastating biological invasion.

In conclusion, the rapid expansion of *C. setaceus* in Calabria represents a serious threat to the biodiversity and functionality of local ecosystems. This research stands as a fundamental step towards fully understanding the extent of the invasion and developing effective management and mitigation strategies, emphasizing the urgency of targeted interventions and greater awareness.

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This work is financed by the Research Project "Eradication of crimson fountaingrass in Calabria: Prevention, eradication and study of the potential expansion of its habitat" - CUP: C37G24000480002, funded by the Region of Calabria (Italy).

4.6. GREENING CITIES WITH NATIVE PLANTS: A MEDITERRANEAN-BASED MODEL FOR GREEN WALLS

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Keywords: Directive 92/43/EEC, Nature-based solutions, smart buildings.

Green infrastructure integrated into buildings, such as Green Walls, represents one of the most effective Nature-based Solutions for addressing urban areas' climatic and environmental challenges [1]. These systems mitigate the urban heat island effect, improve microclimatic comfort, and enhance local biodiversity. However, the success of such systems is highly dependent on proper design and the careful selection of plant species, which must be based on ecological, functional, and territorial criteria [2]. This study developed a multi-phase selection model to identify native species typical of Mediterranean habitats suitable for integration into Green Walls, specifically in central and southern Italy. The first phase involved a selection based on the most compatible life forms (Chamaephytes, Hemicryptophytes, Nanophanerophytes), followed by an ecological evaluation using Ellenberg-Pignatti indicators (Light, Temperature, Moisture, Continentality, and Nutrients) [3]. Subsequently, the species' native habitats were considered (with a preference for rocky and cliff environments) according to the Habitat Directive 92/43/EEC [4], along with their altitudinal and regional distribution.

The whole process resulted in the selection of 480 taxa out of the 7759 taxa listed in the Flora d'Italia [5]. The selected taxa, native and often endemic, mainly belong to the families Asteraceae, Fabaceae and Brassicaceae, known for their high adaptability to environmental stress and ecological functionality [6]. Beyond ecological performance, the use of native species also contributes to strengthening biodiversity, cultural identity, and local landscape continuity-elements that are increasingly relevant in sustainable urban planning. The analysis of geographical distribution showed a higher concentration of suitable species in the southern regions and islands, confirming that Mediterranean areas have great potential as reservoirs of biodiversity for vertical urban greening [7]. By incorporating pedoclimatic and chorological criteria, we were able to avoid one-size-fits-all solutions and promote a context-specific model that can be replicated in other environments with similar climates. The proposed selection model represents a preliminary step toward the development of support tools for ecological urban design. Future studies will need to validate the in situ performance of the selected species in terms of resilience, maintenance requirements, ecosystem benefits, and the aesthetic-perceptual response of the public. Integrating scientific data, experimental application, and urban planning is essential for developing solutions that are effective, resilient, and sustainable over time.

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Author's Index

FIELD TRIP GUIDE

58th INTERNATIONAL CONGRESS
ITALIAN SOCIETY OF VEGETATION SCIENCE
Società Italiana Scienza della Vegetazione (SISV)

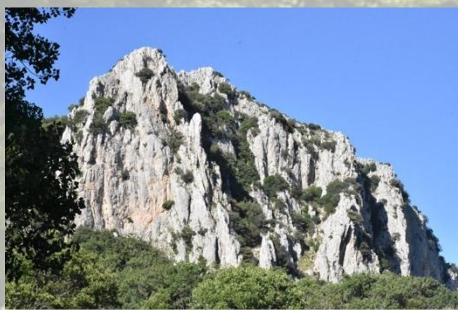
Vegetation Ecology and Diversity for Habitat Monitoring and Conservation

June 19th – 21st, 2025
Mediterranean University of Reggio Calabria
Via dell'Università 25, Reggio Calabria, Italy

June 21st, 2025

Field trip to Aspromonte National Park

Guida Itinerario

A cura di Giovanni Spampinato, Antonio Morabito, Valentina Lucia Astrid Laface, Patti Miriam, Carmelo Maria Musarella

Reggio Calabria giugno 2025

Logo del congresso ideato e realizzato da Valentina Lucia Astrid Laface. Nell'illustrazione: Demetra (*Quercus petraea* (Matt.) Liebl. subsp. *austrotyrrhenica* Brullo, Guarino e Siracusa), la più antica quercia sessile datata al mondo con età stimata al radiocarbonio "wiggle matching" di 934 ± 65 anni.

In copertina foto di Giovanni Spampinato di habitat del Parco Nazionale Aspromonte (Reggio Calabria, Italy). Da sinistra a destra dall'alto in basso: Piano delle Valli, torbiera - habitat 7240; Dolomiti di Canolo, rupi - habitat 8210; Fiumara di Melito, vegetazione glareicola ad *Helichrysum italicum* - habitat 3250. Sullo sfondo: Tre Limiti, boschi misti di *Fagus sylvatica* e *Abies alba* - habitat 9220*.

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INDICE

INTRODUZIONE

L'Aspromonte

Il massiccio aspromontano, estremo lembo della penisola italiana, è costituito da un vasto acrocoro di forma pentagonale che occupa tutta la parte meridionale della Calabria. Il territorio è delimitato a sud e ad est dal Mar Ionio, ad ovest dallo Stretto di Messina, a nord dal Mar Tirreno, mentre a nord-est si congiunge, tramite i Piani della Limina, con le Serre Calabre e con il resto dell'Appennino Calabro. Il confine tra l'Aspromonte e le Serre viene fissato convenzionalmente lungo la linea che congiunge Gioia Tauro sul Tirreno a Marina di Gioiosa Ionica sull'opposto versante ionico. Il territorio, che nel suo complesso ha una superficie superiore a 3.000 Kmq, è caratterizzato da una prima dorsale montuosa che, diramandosi dalle Serre verso sud-ovest, si innalza slargandosi e dando origine a una serie di rilievi di natura cristallina dalla morfologia dolce e tondeggiante culminanti con Montalto (1.956 m). I fianchi del rilievo sono molto ripidi sul Tirreno, mentre sul versante ionico declinano più gradualmente, poiché tra la formazione cristallina principale e il mare si interpone una larga fascia di substrati sedimentari, in genere fortemente erosi.

La caratteristica morfologica più saliente dell'Aspromonte è rappresentata dai terrazzi quaternari di origine marina, o talora continentale, scaglionati a quattro livelli sovrapposti, comunemente chiamati "piani" o "campi", separati da scarpate, localmente dette "petti", che appaiono più evidenti sul fianco nord-occidentale. I più vasti e importanti sono i Piani d'Aspromonte che si sviluppano sul versante dello Stretto di Messina intorno ai 1.000-1.200 m.

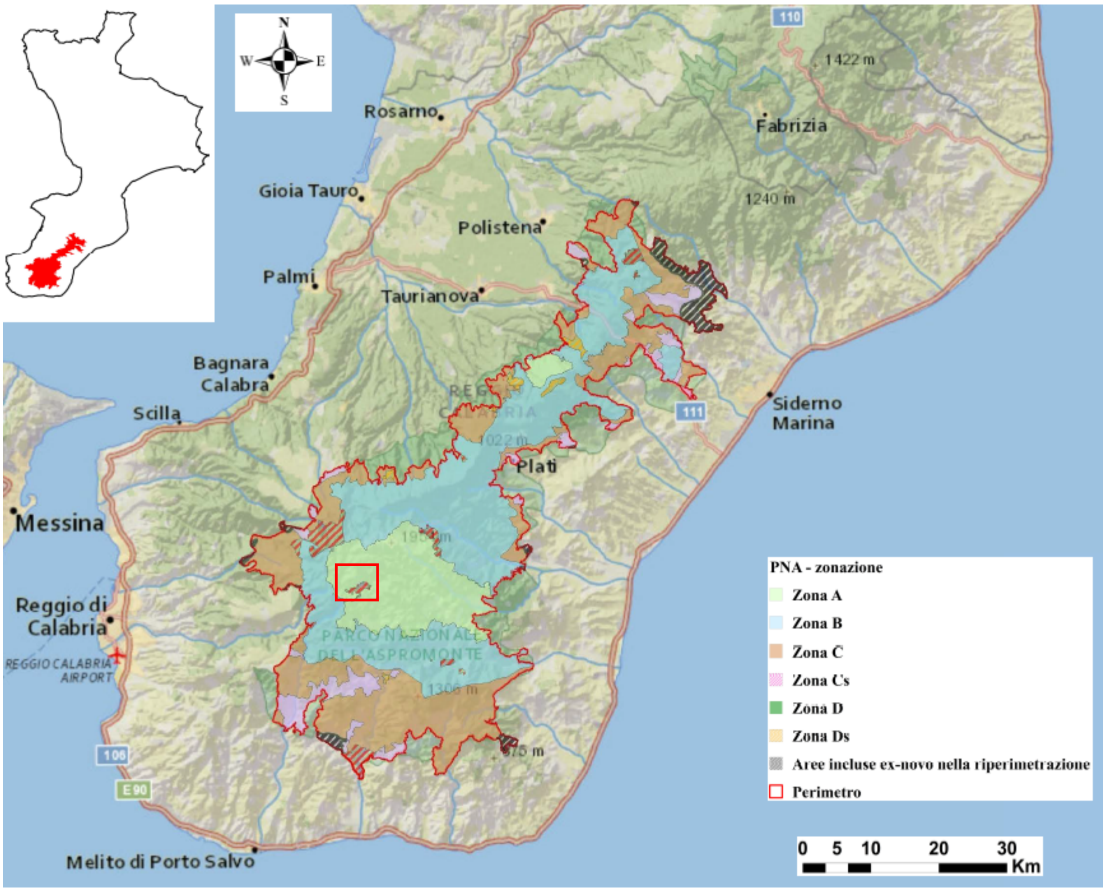

Fig. 1 Il territorio dell'Aspromonte con il Parco Nazionale dell'Aspromonte. Il riquadro in rosso indica l'area dell'escursione (vedi figura 2).

I corsi d'acqua hanno inciso profondamente queste strutture formando, limitatamente alle zone più elevate, strette vallate dai fianchi scoscesi con notevole inclinazione del letto fluviale che nei tratti medi e terminali si slargano costituendo delle ampie fiumare ciottolose, soprattutto sul versante ionico.

Nel complesso, la singolare configurazione geografica dell'Aspromonte si estrinseca in una molteplicità di paesaggi piuttosto differenziati, che manifestano la notevole variabilità geomorfologica, bioclimatica e vegetazionale.

Generalità sul Parco Nazionale dell'Aspromonte

Il progetto di realizzare un grande parco nazionale in Aspromonte risale agli anni '70 del secolo scorso, quando varie associazioni e movimenti d'opinione cominciarono a proporre la realizzazione di un parco come strumento per salvaguardare un'area ad elevata naturalità, rilanciare una delle zone più depresse del mezzogiorno d'Italia e combattere le situazioni di illegalità che si registravano in questo territorio. In quel periodo solo una piccola porzione del territorio aspromontano era protetta e faceva parte del Parco Nazionale della Calabria. Questo parco, istituito nel 1968, era costituito da tre zone: "Sila Grande", "Sila Piccola" ed "Aspromonte"; quest'ultima area era costituita da una parte del demanio forestale dello Stato. Nel complesso la zona "Aspromonte" del Parco della Calabria era di circa 5.000 ha, del tutto insufficienti per attuare una piena conservazione del patrimonio naturale presente nel territorio. Vaste superfici forestali e molti degli ambienti più rilevanti non erano tutelati.

Nel 1994, grazie alla legge 394 sulle aree protette, si diede il via alla istituzione di vari parchi nazionali, tra cui quello dell'Aspromonte, in aggiunta a quelli storici del Circeo, dell'Abruzzo, del Gran Paradiso e dello Stelvio.

Nella prima perimetrazione il territorio del Parco si estendeva per circa 76.000 ha, occupando tutta la fascia montana e gran parte di quella submontana del Massiccio Aspromontano, scendendo in alcune aree del versante ionico, anche in quella collinare. Nel 2009 l'area del Parco Nazionale dell'Aspromonte è stata nuovamente perimetrata con una riduzione di circa 10.000 ha per andare incontro alle diverse necessità delle comunità locali. L'attuale estensione del parco è di circa 64.544 ha e interessa 37 comuni, tutti rientranti nella provincia di Reggio Calabria. Così come previsto nel "Piano del Parco", il parco è suddiviso in 4 zone con differenti livelli di tutela: Zona A (Riserva Integrale), che rappresenta il 15% del territorio, copre circa 9.911 ha; Zona B (Riserva Generale Orientata) costituisce il 43% della superficie totale, pari a circa 27.798 ha; Zona C (Protezione e Promozione) occupa il 29%, estendendosi per circa 18.967 ha; Zona D (Sviluppo e Controllo) copre circa il 6% del Parco, corrispondente a 3.745 ha. Un ulteriore 3% del territorio, pari a circa 1.998 ha, è occupato da aree di nuova inclusione a seguito della recente riperimetrazione del Parco. All'interno di questa zonizzazione, sono presenti anche specifiche aree denominate: Zona DS, che occupa circa il 3% della superficie totale con 1.657 ha, è finalizzata alla riqualificazione urbanistica delle aree esistenti e a interventi edilizi di espansione limitati; Zona CS, che copre l'1% del territorio, corrispondente a 498 ha, è destinata al recupero di case sparse, ruderi e piccoli nuclei insediativi.

Generalità sulla vegetazione

La vegetazione dell'Aspromonte è nel complesso ben conosciuta grazie a numerosi gli studi condotti negli ultimi decenni riportati in bibliografia. Qui di seguito sono evidenziate le principali caratteristiche della vegetazione presente nelle varie fasce bioclimatiche

FASCIA TEMPERATA

La fascia montana del massiccio aspromontano, al di sopra dei 1.000-1.200 m, è interessata da un bioclima di tipo temperato ed è occupata da boschi di faggio che rivestono anche le vette più elevate (Montalto 1.956 m). Le faggete presenti in Aspromonte possono essere ascritte a tre distinte associazioni. L'*Anemono apenninae-Fagetum* (= *Aquifolio-Fagetum sensu* Gentile 1969) è una faggeta termofila legata ad un clima con marcati caratteri di oceanicità presente soprattutto sul versante tirrenico settentrionale e sull'altopiano della Limina; essa è caratterizzata dalla abbondanza nel sottobosco di *Ilex aquifolium.* L'associazione *Galio hirsuti-Fagetum* rappresenta anch'essa una faggeta termofila, ma legata ad un clima con attenuati caratteri di oceanicità; si rinviene sui versanti meridionali e occidentali, e si differenzia per l'assenza o sporadicità di *Ilex aquifolium* e per la presenza di *Galium rotundifolium* subsp. *hirsutum,* e di due orchidee endemiche: *Epipactis meridionalis* e *Limodorum brulloi.* Infine, il *Campanulo trichocalycinae-Fagetum* è una faggeta microterma distribuita dai 1500-1600 m di quota fino ai quasi 2000 m in corrispondenza di Montalto (1956 m slm), dove il faggio si trova al suo limite altitudinale assumendo un portamento arbustivo.

Fagus sylvatica tende a costituire delle formazioni forestali monospecifiche; spesso però, soprattutto sul versante ionico, si associa con l'abete bianco appenninico (*Abies alba* subsp. *apennina*), che svolge in genere un ruolo subordinato. La presenza dell'abete permette di differenziare, per ciascuna associazione di faggeta, delle sub associazioni che assumono il significato di varianti edafiche localizzandosi sui versanti più acclivi con suoli meno evoluti.

L'abete bianco diventa dominante su limitate superfici del versante ionico, tra i 1.500 e i 1.800 m, caratterizzate da suoli poco evoluti e roccia affiorante. In queste aree è possibile rinvenire il *Monotropo-Abietetum apenninae* sui versanti più freschi e lo *Junipero-Abietetum apenninae* in quelli più esposti o nelle zone cacuminali.

Manca una tipica fascia con vegetazione arbustiva altomontana localizzata al di sopra della vegetazione forestale in conseguenza del fatto che le vette aspromontane non superano i 2.000 m di altitudine. Solo su piccole aree cacuminali particolarmente esposte o su alcuni costoni scoscesi e ventilati le formazioni forestali sono sostituite dalla vegetazione a camefite pulvinate e bassi arbusti dei *Rumici-Astragaletea siculi* e dell'*Armerion aspromontanae.* In queste formazioni si localizzano numerose specie di particolare interesse fitogeografico, spesso endemiche, tra cui sono da ricordare *Plantago humilis*, *Juniperus communis* subsp. *hemisphaerica*, *Anthemis cretica* subsp. *calabrica, Armeria aspromontana, Potentilla calabra, Ziziphora granatensis* subsp. *granatnsis, Silene italica* subsp. *sicula, Carlina nebrodensis,* ecc. In particolare, tra le principali associazioni a camefite pulvinate vanno ricordate l'*Armerio aspromontanae-Potentilletum calabricae*, localizzata sui dossi rocciosi all'interno della faggeta del *Campanulo trichocalycinae-Fagetum,* l'*Armerio aspromontanae-Plantaginetum humilis*, ubicato nelle zone cacuminali esposte e ventilate, ed il *Poo alpinae-Minuartietum condensatae*, presente invece sulle creste rupestri localizzate sopra i 1.600 m.

Sul versante ionico sotto i 1.500-1.400 m le faggete vengono sostituite, limitatamente alle superfici più acclivi e soleggiate con suoli poco evoluti, dalle pinete dell'*Hypochoerido laevigatae-Pinetum calabricae,* fisionomicamente dominate dall'endemica siculo-calabra *Pinus nigra* subsp. *laricio* var. *calabrica.* Frammista al faggio si trova talora *Quercus petraea* subsp. *austrotyrrhenica*, la quale, a causa di tagli e incendi, si rinviene attualmente in individui isolati, molto vetusti, o più raramente in piccoli nuclei riferiti all'associazione *Aristolochio luteae-Quercetum austrotyrrhenicae.*

Le faggete sono spesso attraversate da piccoli corsi d'acqua permanenti alimentati da sorgenti, dove si localizzano aspetti di vegetazione igrofila erbacea che ospitano una flora molto specializzata tra cui le endemiche *Cryptotaenia thomasii, Epipactis aspromontana, Adenostyles alpina* subsp. *macrocephala, Chaerophyllum hirsutum* var. *calabricum*, *Alchemilla austroitalica* e *Soldanella calabrella.* In particolare, nei ruscelli ombreggiati con acqua corrente si rinviene il *Chrysosplenio-Lereschietum thomasii,* mentre nei tratti più rialzati ed esterni all'alveo è localizzato il *Petasito-Chaerophylletum calabrici,* che nei tratti più soleggiati viene sostituito dal *Rynchocorido-Alchemilletum austroitalicae.* Sulle pareti stillicidiose prospicienti questi piccoli corsi d'acqua si rinviene invece l'*Adenostylo-Soldanelletum calabrellae.* Lungo i corsi d'acqua di maggiore portata si rinvengono delle tipiche formazioni riparie, rappresentate in particolare da boscaglie igrofile del *Geranio versicoloris-Salicetum* *oropotamicae* caratterizzate dall'endemica *Salix oropotamica,* e da alneti dell'*Euphorbio corallioidis-Alnetum glutinosae.*

Nel vasto altopiano posto intorno ai 1.000 m di quota le faggete sono state eliminate e sostituite da campi di cereali, orticole, patate, ecc., o da rimboschimenti realizzati in genere con *Pinus nigra* subsp. *laricio* var. *calabrica*. L'abbandono delle colture determina l'insediamento immediato di una fitta vegetazione a *Pteridium aquilinum* subsp. *aquilinum* e subito dopo dei cespuglieti a *Cytisus scoparius* subsp. *scoparius* del *Polygalo-Cytisetum scoparii.* Nelle depressioni umide, che talora si rinvengono sugli altopiani, si osservano invece i cespuglieti del *Genisto brutiae-Cytisetum scoparii*, associazione caratterizzata dalla presenza di *Genista brutia* (specie tassonomicamente affine a *Genista anglica* distribuita nell'Europa atlantica). Nelle depressioni dell'altopiano si osservano talora aspetti di vegetazione palustre di particolare rilevanza naturalistica, come la torbiera di Canolo Nuovo.

FASCIA SUPRAMEDITERRANEA

La fascia supramediterranea è scarsamente rappresentata o talora anche assente, in quanto la notevole oceanicità del clima favorisce, soprattutto sul versante tirrenico, lo spostamento verso il basso del bioclima temperato. Si osserva infatti il passaggio diretto dalla fascia supratemperata a quella mesomediterranea. Questo contatto è particolarmente evidente sui ripidi crinali del versante occidentale, dove le faggete dell'*Anemono apennine-Fagetum sylvaticae*, prendono contatto con le leccete del *Teucrio siculi-Quercetum ilicis.*

Solo sul versante ionico la fascia supramediterranea è ben rappresentata e risulta occupata dai boschi a *Quercus frainetto* appartenenti al *Cytiso villosi-Quercetum frainetto*, o più raramente dai boschi dell'*Erico-Quercetum congestae.* Frequentemente queste formazioni forestali sono sostituite da impianti di castagno, realizzati comunemente anche nella fascia temperata ed in quella mesomediterranea.

FASCIA MESOMEDITERRANEA

La fascia mesomediterranea è interessata da querceti dei *Quercetea ilicis,* ed è rinvenibile fino a circa 800-1.100 m di quota sui versanti localizzati sotto gli altopiani. In particolare, i ripidi versanti del lato tirrenico sono occupati dalle leccete del *Teucrio siculi-Quercetum ilicis.* Più raramente, nelle stazioni con suoli sabbiosi acidi, si insediano le sugherete dell'*Helleboro-Quercetum suberis.* Nei tratti meno acclivi con suoli più profondi sono invece presenti i querceti caducifogli del *Festuco heterophyllae-Quercetum congestae*, spesso sostituiti da impianti di *Castanea sativa*, formazione colturale molto diffusa in Aspromonte. Nei valloni più ombreggiati e freschi sono presenti i boschi misti di *Acer neapolitanum*, *Ostrya carpinifolia* e *Quercus ilex* del *Festuco-Aceretum neapolitani.* Nei valloni più incassati si localizzano inoltre alcune stazioni di *Woodwardia radicans,* felce relitta di una flora tropical-montana presente in Italia nel Terziario che, in seguito alle vicende climatiche del Quaternario, ha assunto una tipica distribuzione relittuale. *Woodwardia radicans* caratterizza una tipica vegetazione brio-pteridofitica, riferita al *Conocephalo-Woodwardietum radicantis*, che si localizza sulle superfici ombreggiate interessate da stillicidio.

Nelle stazioni costiere e collinari del versante tirrenico le leccete, normalmente governate a ceduo, sono rappresentate dall'*Erico-Quercetum ilicis.* Si tratta di una lecceta termofila osservabile dal livello del mare che, in seguito ai processi di degradazione, spesso viene sostituita da una fitta macchia riferibile all'*Erico arboreae-Myrtetum communis* e da praterie steppiche ad *Ampelodesmos mauritanicus.*

Sul versante ionico e su quello dello Stretto le leccete sono accantonate sui pendii più freschi e sostituite altrove dai querceti dell'*Erico-Quercetum virgilianae.* Sul versante ionico orientale e sud-orientale sono inoltre presenti i boschi misti di leccio e farnetto del *Quercetum frainetto-ilicis*. La degradazione dei boschi dei *Quercetea ilicis*, in seguito al pascolo e agli incendi, favorisce l'insediamento di macchia del *Calicotomo infestae-Ericetum arboreae*, limitatamente alle stazioni dove è presente ancora il suolo, mentre nei tratti più erosi e aridi si insediano le garighe del *Cisto eriocephali-Phlomidetum fruticosae.* L'ulteriore degradazione dei cespuglieti favorisce l'insediamento di praterie steppiche dell'*Avenulo-Ampelodesmion mauritanici,* che normalmente formano un mosaico con i pratelli terofitici del *Tuberarion guttatae.*

FASCIA TERMOMEDITERRANEA

Questa fascia è ben rappresentata soprattutto sul versante ionico meridionale dell'Aspromonte, mentre è assente, o presente in modo frammentario, su quello tirrenico. Quest'ultimo versante strapiomba rapidamente nel Tirreno formando le alte falesie della Costa Viola. Su queste pareti rocciose più o meno verticali, costituite in genere da gneiss o graniti, è presente la vegetazione casmofila dell'*Erucastretum virgati,* associazione del *Dianthion rupicolae,* in cui si localizzano alcuni endemismi quali *Jacobaea maritima* subsp. *gibbosa*, *Erucastrum virgatum* subsp. *virgatum, Dianthus rupicola*, *Centaurea scillae,* ecc. Sulle cenge rocciose si insedia la macchia termo-xerofila dell'*Oleo-Euphorbietum dendroidis*.

Sui versanti ionici e su quello dello Stretto di Messina la fascia termomediterranea ha invece un più ampio sviluppo e si estende verso l'interno fino ai 300-400 m di quota. Qui il paesaggio è di tipo collinare e le coste sono di tipo prevalentemente basso. La forte antropizzazione di questo territorio ha però determinato una profonda alterazione della copertura vegetale. Le formazioni di macchia e i querceti termofili che rappresentavano le formazioni climax sono state eliminate e sostituite da diverse tipologie di praterie steppiche che attualmente caratterizzano il paesaggio di questa fascia costiera.

La vegetazione naturale potenziale è rappresentata dalla macchia termo-xerofila del *Myrto-Pistacietum lentisci,* localizzata a quote inferiori a 200-300 m, all'interno della fascia bioclimatica termomediterranea secca, caratterizzata da precipitazioni annue inferiori a 600 mm. Sui versanti più acclivi e rocciosi il *Myrto-Pistacietum lentisci* viene sostituito dall'*Oleo-Euphorbietum dendroidis*, mentre su quelli argillosi o marnosi viene sostituito dall'*Oleo-Juniperetum turbinatae.* È questa una macchia edafo-xerofila attualmente ridotta a pochi lembi relitti a causa dell'antropizzazione; potenzialmente questa macchia occuperebbe un'ampia fascia costiera del versante meridionale dell'Aspromonte, soprattutto in relazione al notevole sviluppo che hanno i substrati argillosi o argilloso-marnosi.

La distruzione della macchia per gli incendi favorisce l'insediamento delle garighe del *Cisto-Ericion,* quali il *Rosmarino-Thymeletum hirsutae*, il *Thymo-Lavanduletum multifidae* e delle praterie steppiche dell'*Hyparrhenion hirtae* e dell'*Ampelodesmion mauritanici.* Sui substrati argillosi i processi di erosione danno origine alla formazione di calanchi generalmente colonizzati da *Lygeum spartum* che caratterizza le praterie steppiche del *Loto-Lygetum spartii.* Questi ambienti ospitano alcune specie prettamente termo-xerofile di un certo interesse fitogeografico, fra cui *Fagonia cretica*, *Plantago amplexicaulis*, *Aizoanthemopsis hispanicum*, *Parapholis pycnantha,* ecc.

Le rupi del versante ionico sono meno imponenti rispetto a quelle del versante tirrenico e costituite per lo più da conglomerati; la vegetazione di queste rupi, riferibile al *Centaureion pentadactyli,* ospita alcuni endemismi calabresi come *Silene calabra*, *Helianthemum farinulentum*, *Allium pentadactyli, Centaurea pentadactyli* e *Crepis aspromontana*.

VEGETAZIONE DEI LITORALI

Le coste della Calabria meridionale sono molto antropizzate sia per l'ubicazione della rete viaria e ferroviaria in prossimità della linea di costa, sia per la intensa urbanizzazione, conseguente lo spostamento nell'ultimo cinquantennio di numerosi centri abitati dall'entroterra alle zone costiere con la creazione delle cosiddette "Marine". La vegetazione costiera è quindi fortemente degradata e frammentata; ancora oggi si assiste ad una continua espansione degli agglomerati urbani a discapito degli habitat naturali.

Le coste del versante ionico sono per lo più basse, di tipo sabbioso-ghiaioso, e solo su limitati tratti è possibile osservare frammenti, spesso degradati della vegetazione psammofila. Si tratta in particolare del *Cypero mucronati-Agropyretum farcti* legato alle dune embrionali, del *Medicagini-Ammophiletum arundinaceae* tipico delle dune mobili e dell'*Helichryso italici-Ephedretum distachyae* circoscritto alle stazioni retrodunali.

Le coste del versante tirrenico, in corrispondenza della Costa Viola, sono alte e rocciose e, limitatamente ad alcuni tratti, è possibile osservare la vegetazione aeroalina dei *Crithmo-Limonietea* ed in particolare il *Limonietum calabrum* ed il *Limonietum brutium.*

VEGETAZIONE DEI CORSI D'ACQUA

Nei tratti montani e submontani, che scorrono in valli in genere piuttosto incassate, i corsi d'acqua sono fiancheggiati da ripisilve ad *Alnus glutinosa* riferibili a tre distinte associazioni: *Euphorbio-Alnetum glutinosae*, tipico dei tratti montani poco acclivi con alluvioni fini; il *Polystico-Alnetum glutinosae,* localizzato nelle valli profonde e fresche della zona submontana e collinare e l'*Alnetum glutinoso-cordatae,* tipico delle valli più aperte della zona collinare su alluvioni di natura ciottoloso-ghiaiosa. Nelle vallate più aperte e in condizioni di maggiore disturbo arrecato dalle piene, gli alneti lasciano il posto ai saliceti, quali il *Salicetum albo-brutiae.*

I corsi d'acqua del versante ionico, nei loro tratti medi e terminali, assumono la tipica fisionomia di "fiumara". Presentano ampi greti ciottolosi, in genere asciutti in estate, ed hanno un regime prettamente torrentizio con impetuose piene invernali e lunghi periodi di magra estiva. La genesi delle "fiumare" è da collegare al particolare regime delle precipitazioni che sono concentrate in pochi eventi temporaleschi e alla natura dei substrati geologici, rappresentati in genere da metamorfiti particolarmente alterate, friabili e facilmente erodibili, sia per l'accentuata pendenza che per le azioni di disboscamento. I vistosi fenomeni di erosione da parte delle acque meteoriche determinano un notevole trasporto dei materiali solidi che vengono depositati nel tratto terminale del letto fluviale, via via che l'energia della corrente fluviale diminuisce. Si vengono così a formare ingenti depositi alluvionali di natura ghiaiosa che caratterizzano le fiumare. La vegetazione riparia delle fiumare è costituita da boscaglie dei *Nerio-Tamaricetea,* con *Nerium oleander, Tamarix africana*, *T. gallica* e *Vitex agnus-castus*, che si localizzano sui terrazzi meno disturbati dalle piene invernali. Sui terrazzi alluvionali rimaneggiati dalle piene, secchi in estate, si insedia invece una vegetazione pioniera di tipo glareicolo con *Helichrysum italicum, Scrophularia canina* subsp. *bicolor, Artemisia campestris* subsp. *variabilis*, dell'*Artemisio-Helichrysetum italici,* associazione diffusa nelle fiumare calabresi.

ITINERARIO

Programma dell'escursione (tutti gli orari, tranne il raduno e la partenza, sono indicativi)

Ore 7.30 - Raduno dei partecipanti presso Piazza Indipendenza, antistante la stazione ferroviaria di Reggio Calabria Lido.

Ore 8.00 - Partenza da Reggio Calabria.

Ore 9.30 - Arrivo alla diga del Menta (1.450 m) [1] ed escursione fino al punto panoramico sulle cascate Maesano nell'alto corso della fiumara Amendolea. Sosta di circa 2 ore. Arrivati alla diga sul Menta si prosegue a piedi lungo il sentiero che scende sotto la diga e porta ad un punto panoramico sulle cascate Maesano.

Osservazioni su: pinete a pino nero calabrese dell'*Hypochoerido laevigatae-Pinetum calabricae*; faggete del *Galio hirsuti-Fagetum sylvaticae*; pascoli orofili dell'*Armerion aspromontanae*; vegetazione igrofila del *Veronico beccabungae-Ranunculetum ophioglossifolii* e del *Petasito albi-Chaerophylletum calabricae*; cespuglieti a ginestre del *Cytisetum villoso-scopari*; ripisilve dell'*Euphorbio corallioidis-Alnetum glutinosae*.

Ore 12.30 - Sosta all'area Picnic dei Piani di Salo per il pranzo al sacco.

Ore 14.00 - Arrivo in C.da Tre Limiti (1.550 m) [2]. Sosta di circa un'ora per visitare l'alto corso del Torrente Menta.

Osservazioni su: faggete microterme del *Campanulo trichocalycinae-Fagetum sylvaticae,* abetine dello *Junipero-Abietetum apenninae*; vegetazione igrofila rivulare del *Rhynchocorydo-Alchemilletum austroitalicae*, del *Petasito-Chaerophylletum calabrici* e *dell'Adenostylo-Soldanelletum calabrellae.*

Ore 15.30 - Partenza dalla C.da Tre Limiti.

Ore 17.00 - Arrivo a Reggio Calabria.

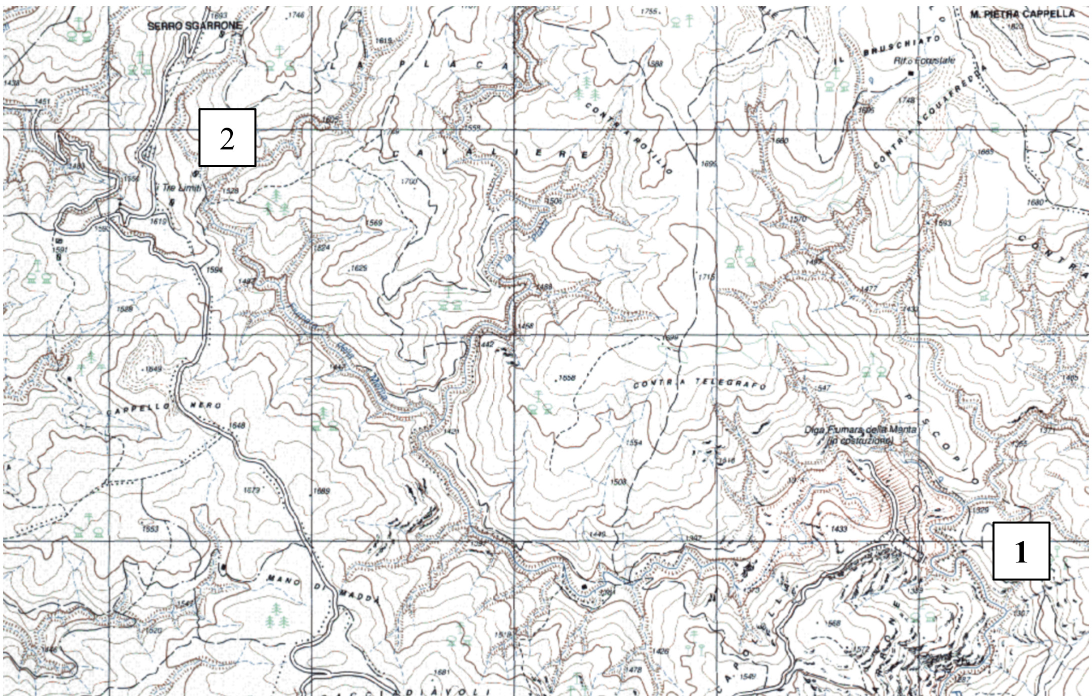

Figura 2. Localizzazione delle due soste dell'escursione nel Parco Nazionale dell'Aspromonte.

I sosta: Cascate Maesano (1450-1300 m)

La Fiumara Amendolea si origina dalla confluenza del Torrente Menta con una serie di affluenti minori. Scendendo dagli altopiani, la Fiumara Amendolea forma le Cascate Maesano, le più alte e spettacolari dell'Aspromonte.

Il sentiero che porta al punto panoramico sulle cascate parte della diga sul Torrente Menta e si snoda attraverso le faggete del *Galio hirsuti-Fagetum sylvaticae* (Tab. 1) e, soprattutto, attraverso le pinete oro-mediterranee a *Pinus nigra* subsp. *laricio* var. *calabrica* dell'*Hypochoendo lariconis-Pinetum calabricae* (Habitat Direttiva CEE 43/92: 9530* - Pinete (sub)mediterranee di pini neri endemici). Queste pinete sono differenziate da *Hypochaeris laevigata* e *Festuca trichophylla* subsp. *asperifolia* nello strato erbaceo (Tab. 2). Le pinete di pino nero calabrese sono distribuite sui substrati silicei dell'Appennino Calabro (Sila e Aspromonte), anche in conseguenza di impianti realizzati nel secondo dopoguerra. In Aspromonte sono molto diffuse in tutta la fascia montana del versante ionico del massiccio tra 1.000-1.100 e 1.400-1.500 e caratterizzano profondamente il paesaggio. Sotto il profilo dinamico l'*Hypochoerido laricionis-Pinetum calabricae* può rappresentare un particolare edafoclimax che sostituisce la faggeta sui versanti più acclivi e con esposizioni calde dove il processo pedogenetico è bloccato e i suoli sono poco evoluti. In alternativa, sulle superfici meno acclivi, dove la pedogenesi non è bloccata, la pineta rappresenta uno stadio della serie della faggeta del *Galio hirsuti-Fagetum sylvaticae*. Il mantello forestale di queste pinete è rappresentato dai cespuglieti del *Cytisetum villoso-scoparii*, la cui diffusione viene favorita dagli incendi (Tab. 3).

Le ripisilve a ontano nero che fiancheggiano il corso del Torrente Menta e l'alto corso della Fiumara Amendolea sono riferibili all'*Euphorbio corallioidis-Alnetum glutinosae* (Tab. 4), associazione tipica dei corsi d'acqua poco acclivi della fascia montana dell'Appennino Calabro, tra 900 e il 1.300, su suoli alluvionali di natura silicea originati da metamorfiti o da graniti e granodioriti, in aree a bioclima temperato oceanico (Habitat Direttiva CEE 43/92: 91E0* - Foreste alluvionali di *Alnus glutinosa* e *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae).

Lungo il sentiero che porta al punto panoramico di affaccio sulle cascate si rinvengono rivoli e piccoli corsi d'acqua alimentati da acque oligotrofiche, debolmente fluenti, che nei tratti più aperti e soleggiati sono interessati da una vegetazione fontinale con *Veronica beccabunga, Ranunculus ophioglossifolium, Stellaria alsine, Cardamine flexuosa*, riferibile al *Veronico beccabungae-Ranunculetum ophioglossifolii* (Tab. 5), mentre dove si ha un deposito di materiale organico costituito da foglie e altri resti vegetali è presente la vegetazione igro-nitrofila nemorale del *Petasito albi-Chaerophylletum calabricae,* legata a stazioni umide non necessariamente sommerse (Tab. 6).

Nelle aree rocciose aperte sono presenti i pascoli orofili dell'*Armerion aspromontaneae*, formazioni in genere primarie con ruolo edafofilo, più raramente secondarie, rappresentando in questo secondo caso degli stadi di degradazione delle formazioni forestali dei *Fagetalia sylvaticae*. L'associazione più diffusa di questa alleanza è *Armerio apsromontanae-Potentilletum calabricae* caratterizzata da *Armeria aspromontana* e *Potentilla calabra* (Tab. 7).

Sporadicamente lungo i displuvi che percorrono il sentiero sono presenti individui isolati o piccoli gruppi di *Quercus petraea* subsp. *austrotyrrhenica* che testimoniano la presenza di querceti andati distrutti probabilmente a causa di tagli e incendi. In altre aree del Parco questa specie caratterizza la peculiare vegetazione forestale dell'*Aristolochio luteae-Quercetum austrotyrrhenicae.*

II sosta: Torr. Menta contrada Tre Limiti (1.550 m)

L'alta vallata del Menta è interessata dalle faggete microterme del *Campanulo trichocalycinae-Fagetum sylvaticae* (Tab. 8), formazioni forestali piuttosto povere sotto il profilo floristico, caratterizzate dalla netta dominanza del faggio nello strato arboreo, cui si associa talora anche l'abete bianco appenninico (*Abies alba* subsp. *apennina*), mentre nello strato erbaceo con bassi valori di copertura si rinvengono *Asyneuma trichocalycinum, Clinopodium grandiflorum, Neottia nidus-avis,* ecc.

Nelle stazioni cacuminali, sui dossi e sui costoni rocciosi con suoli superficiali e poco evoluti, le faggete sono sostituite da boschi radi fisionomicamente caratterizzati dalla dominanza di *Abies alba* subsp. *apennina* con *Juniperus communis* subsp. *hemisphaerica* nello strato arbustivo (Tab. 8). Questa vegetazione, riferita allo *Junipero hemisphaericae-Abietetum apenninae* (Habitat Direttiva CEE 43/92: 9510* - Foreste sud-appenniniche di Abies alba), può essere considerata come una comunità di tipo relittuale, risalente probabilmente al Terziario (Tab. 9) che è rimasta accantonata in ambienti più difficili dalla diffusione dei boschi di faggio del quaternario. Lo *Junipero hemisphaericae-Abietetum apenninae* rientra nella classe *Junipero sabinae-Pinetea sylvestris*, che riunisce le formazioni arboreo-arbustive oro-mediterranee a dominanza di gimnosperme. Altri boschi a dominanza di *Abies alba* subsp. *apennina,* presenti in altre località dell'Aspromonte su suoli meno superficiali, sono invece riferiti al *Monotropo hypopytyos-Abietetum apenninae*, abetine che per il loro corteggio floristico si inquadrano nei *Querco roboris-Fagetea sylvaticae.*

Nei tratti più rocciosi e aperti sono presenti pascoli xerofili orofili caratterizzati da piccole camefite ed emicriptofite di particolare interesse fitogeografico, spesso endemiche, come *Anthemis cretica* subsp. *calabrica, Armeria aspromontana, Potentilla calabra, Ziziphora granatensis* subsp. *granatensis, Silene italica* subsp. *sicula, Carlina nebrodensis*, riferibili all'*Armerion aspromontanae* e in particolare all'*Armerio-Potentilletum calabrae.* Al loro interno è possibile osservare i pratelli terofitici dello *Sclerantho-Sedetum gussonei* (Tab. 10), caratterizzati dalla presenza di diverse terofite silicicole fra cui *Sedum annuum* subsp. *gussonei*, endemismo che in Aspromonte vicaria la sottospecie tipica (*Sedum annuum* subsp. *annuum*) a distribuzione artico-alpina. Sui detriti presenti lungo le scarpate si rinviene la vegetazione di tipo glareicolo del *Senecioni calabricae-Cardaminetum glaucae.*

Il torrente Menta e i suoi affluenti, analogamente agli altri corsi d'acqua della fascia montana dell'Aspromonte alimentati da sorgenti perenni, rappresentano degli ambienti di notevole valore conservazionistico, in quanto ospitano una flora igrofila ricca in endemismi, fra cui sono da ricordare *Soldanella calabrella, Cryptotaenia thomasii, Epipactis aspromontana, Adenostyles alpina* subsp. *macrocephala, Chaerophyllum hirsutum* var. *calabricum*, *Alchemilla austroitalica.* In particolare, nelle zone aperte inondate solo eccezionalmente, si localizza il *Rhynchocorydo-Alchemilletum austroitalicae* (Tab. 11), associazione molto rara, fisionomicamente caratterizzata dall'endemica *Alchemilla austroitalica,* unica rappresentante in Italia della sez. *erectae* a distribuzione orientale. Nei tratti più umidi con accentuata pendenza, come in prossimità delle piccole cascate, si insedia invece il *Petasito-Chaerophylletum calabrici*, mentre sulle piccole pareti prospicienti il corso d'acqua interessate da stillicidio o da spruzzi d'acqua è presente l'*Adenostylo macrocephalo-Soldanelletum calabrellae* (Tab. 12), vegetazione formata da un tappeto muscinale su cui si insediano le endemiche *Soldanella calabrella* e *Adenostyles alpina* subsp. *macrocephala.*

Le acque correnti del Torrente Menta e dei suoi affluenti sono interessate dallo *Scapanietum undulatae*, associazione briofitica della fascia montana legata ad acque limpide, fredde e ben ossigenate.

SCHEMA SINTASSONOMICO

Schema sintassonomico delle principali unità osservabili durante l'escursione

QUERCO ROBORIS-FAGETEA SYLVATICAE Br.Br. & Vlieger in Vlieger 1937
FAGETALIA SYLVATICAE Pawl. in Pawl. et al 1928
DORONICO-FAGION Ubaldi et al. ex Ubaldi 1995 *Galio hirsuti-Fagetum* Brullo, Scelsi & Spampinato 2001
Hypochoerido laricionis-Pinetum calabricae Bonin ex Brullo, Scelsi& Spampinato 2001
CAMPANULO TRICHOCALYCINAE-FAGION Ubaldi et al. ex Ubaldi 1995
Campanulo trichocalycinae-Fagetum Gentile 1969
Monotropo hypopityo-Abietetum apenninae Brullo Scelsi & Spampinato 2001

ALNO GLUTINOSAE-POPULETEA ALBAE P. Fukarek et Fabijanić 1968
POPULETALIA ALBAE Br.- Bl. ex Tchou 1948
OSMUNDO REGALIS-ALNION GLUTINOSAE (Br.-Bl. et al. 1956) Dierschke and Rivas-Martínez in Rivas-Martínez 1975
Euphorbio corallioidi-Alnetum glutinosae Brullo & Furnari in Barbagallo et al. 1982

JUNIPERO SABINAE-PINETEA SYLVESTRIS Rivas-Martínez 1965 Nom. Inv. Propos. Rivas- Martínez, Diaz, Fernández-González, Izco, Loidi, Lousa & Penas 2002
JUNIPERO SABINAE-PINETALIA SYLVESTRIS Rivas-Martínez 1965 nom. inv. propos. Rivas-Martínez, Diaz, Fernández-González, Izco, Loidi, Lousa & Penas 2002
PINION CALABRICAE Brullo, Scelsi & Spampinato 1999
Junipero hemisphaericae-Abietetum apenninae Brullo, Scelsi & Spampinato 1999

CYTISETEA STRIATO-SCOPARII Rivas Martinez 1974
CYTISETALIA STRIATO-SCOPARII Rivas Martinez 1974
VIOLION MESSANENSIS Brullo & Furnari in Barbagallo et al. 1982
Cytisetum villoso-scoparii Brullo, Scelsi & Spampinato 2001

RUMICI-ASTRAGALETEA SICULI Pignatti & Nimis in Pignatti et al. 1980 em. Mucina 1997
ANTHEMIDETALIA CALABRICAE Brullo, Scelsi &-Spampinato 2001
ARMERION ASPROMONTANAE Brullo, Scelsi & Spampinato 2001
Armerio aspromontanae-Potentilletum calabrae Brullo, Scelsi & Spampinato 2001

ASPLENIETEA TRICHOMANIS (Br.-Bl. in Meier & Br.-Bl. 1934) Oberd.1977
ANOMODONTO-POLYPODIETALIA O. Bolòs O. Vives in O. Bolòs 1957
POLIO-ASPLENION SEPTENTRIONALIS Brullo & Siracusa in Brullo et al. 2000
Asplenio septentrionalis-Hieracietum aspromontani Brullo, Scelsi & Spampinato 2001
HYPNO-POLYPODIETALIA VULGARIS Jurko & Peciar ex Brullo, Scelsi & Spampinato 2001
HYPNO-POLYPODION VULGARIS Mucina 1993
Rhyncostegio conferti-Polypodietum vulgaris Brullo
Scelsi & Spampinato 2001

SCROPHULARIO HELICHRYSETEA Brullo, Scelsi & Spampinato 1998
SCROPHULARIO HELICHRYSETALIA Brullo 1984
LINARION PURPUREAE Brullo 1984
Senecioni calabrici-Cardaminetum glaucae Brullo, Scelsi & Spampinato 2001

TUBERARIETEA-GUTTATAE (Br-BI. 1940) Rivas Goday & Rivas Martinez 1963
TUBERARIETALIA GUTTATAE Br-BI.1940
SCLERANTHO-MYOSOTIDION INCRASSATAE Brullo, Scelsi & Spampinato 2001
Scleranthо-Sedetum annui Brullo, Scelsi & Spampinato 2001

PLATYHYPNIDIO-FONTINALETEA ANTIPYRETICAE Philippi 1956
HYGROHYPNETALIA Krajina 1933 RACOMITRION ACICULARIS v. Krusenstjerna 1945 ex Philippi 1956
Scapanietum undulatae Schwickerath 1944

MOLINIO-ARRHENATERETEA R. Tx. 1937
HOLOSCHOENETALIA Br.-Bl. ex Tchou 1948
DACTYLORHIZO-JUNCION STRIATI Brullo & Grillo 1978
Dactylorhizo-Juncetum effusi Brullo & Grillo 1978

MONTIO-CARDAMINETEA Br.-BI. & R. Tx. Ex Br.-Bl. 1948
MONTIO-CARDAMINETALIA Pawlowski in Pawlowski et al. 1928
CARICION REMOTAE Kästner 1941
Adenostylo-Soldanelletum calabrellae Signorello 1986
Rhynchocoryto-Alchemilletum austroitalicae Brullo, Scelsi & Spampinato 2001

EPILOBIETEA ANGUSTIFOLII Tuxen & Preising ex Von Rochow 1951
ATROPETALIA BELLADONNAE Vlieger 1937
ATROPION BELLADONNAE Br.-Bl. ex Aichinger 1933
Chrysosplenio-Lereschietum thomasii Brullo & Furnari in Barbagallo et al. 1982
Petasito-Chaerophylletum calabrici Brullo, Scelsi & Spampinato 2001

ELENCO DELLA FLORA

Elenco della flora citata nel testo e rinvenibile durante l'escursione.

PTERIDOFITAE
ATHYRIACEAE
Athyrium filix-femina (L.) Roth
Aspleniaceae
Asplenium onopteris L.
Asplenium septentrionale (L.) Hoffm. subsp. septentrionale
Asplenium trichomanes L.
BLECHNACEAE
Struthiopteris spicant (L.) Weiss
DRYOPTERIDACEAE
Dryopteris pseudomas (Woll.) Holub & Pouzar subsp. pseudomas
Polystichum setiferum (Forssk.) T.Moore ex Woyn.
EQUISETACEAE
Equisetum telmateia Ehrh.
Hypolepidaceae
Pteridium aquilinum (L.) Kuhn subsp. aquilinum
POLYPODIACEAE
Polypodium vulgare L.
CYSTOPTERIDACEAE
Cystopteris fragilis (L.) Bernh.

GYMNOSPERMAE
CUPRESSACEAE
Juniperus communis L.
PINACEAE
Abies alba Mill.
Pinus nigra J.F. Arnold subsp. laricio Palib. ex Maire var. calabrica

AMARYLLIDACEAE
Allium paniculatum L.
Allium ursinum L.
Allium vineale L.
Asphodeline lutea (L.) Rchb.
Asphodelus ramosus L.
Muscari commutatum Guss.
Polygonatum multiflorum (L.) All.
Ruscus aculeatus L.
Scilla bifolia L.

APIACEAE
Angelica sylvestris L. subsp. sylvestris L.
Anthriscus nemorosa (M.Bieb.) Spreng.
Bunium petraeum Ten.
Bupleurum falcatum L. subsp. cernuum (Nyman) Arcang.
Chaerophyllum hirsutum L. var. calabricum
Chaerophyllum temulum L.
Cryptotaenia thomasii (Ten.) DC.
Daucus carota L. subsp. carota
Heracleum sphondylium L. subsp. elegans (Crantz) Schübl. & G.Martens
Oenanthe pimpinelloides L.
Pimpinella anisoides Brig.
Sanicula europaea L.

AQUIFOLIACEAE
Ilex aquifolium L.

ARALIACEAE
Hedera helix L. subsp. helix

ASTERACEAE
Achillea ligustica All.
Adenostyles alpina (L.) Bluff & Fingerh. subsp. macrocephala (Huter, Porta & Rigo) Dillenb. & Kadereit
Anthemis arvensis L. subsp. sphacelata (C.Presl) R.Fern.
Anthemis cretica L. subsp. calabrica (Arcang.) R.Fern.
Arctium lappa L.
Bellis perennis L.
Carduus nutans L. subsp. nutans
Carduus nutans L. subsp. scabrisquamus Arènes
Carduus pycnocephalus L.
Carlina hispanica Lam. subsp. globosa (Arcang.) Meusel & Kästner
Carlina nebrodensis Guss. ex DC.
Centaurea poeltiana Puntillo
Cirsium arvense (L.) Scop.
Crepis leontodontoides All.
Crepis vesicaria L.
Eupatorium cannabinum L.
Helichrysum italicum (Roth) G.Don
Hieracium aspromontanum Brullo, Scelsi & Spamp.
Hypochaeris laevigata (L.) Ces., Pass. & Gibelli
Hypochaeris radicata L.
Hypochaeris urens L.
Logfia heterantha (Raf.) Holub
Mycelis muralis (L.) Dumort. subsp. muralis
Petasites albus (L.) Gaertn.
Pilosella piloselloides (Vill.) Soják
Pilosella testimonialis (Nägeli ex J.Hofm.) Gottschl.
Pulicaria odora (L.) Rchb.
Senecio ovatus (G.Gaertn., B.Mey. & Scherb.) Willd. subsp. stabianus (Lacaita) Greuter
Solidago virgaurea L. subsp. virgaurea
Taraxacum minimum (V.Brig.) N.Terracc.
Tolpis virgata (Desf.) Bertol. subsp. grandiflora (Ten.) Arcang.
Tussilago farfara L.

BETULACEAE
Alnus glutinosa (L.) Gaertn.

BORAGINACEAE
Anchusella cretica (Mill.) Bigazzi, E.Nardi & Selvi
Myosotis incrassata Guss.
Myosotis sylvatica Hoffm.

Symphytum bulbosum K.F. Schimp.

BRASSICACEAE
Alliaria petiolata (M.Bieb.) Cavara & Grande
Arabis alpina L. subsp. caucasica (Willd.) Briq
Arabis collina Ten.
Arabis verna (L.) W.T.Aiton
Barbarea bracteosa Guss.
Cardamine chelidonia L.
Cardamine flexuosa With.
Cardamine glauca Spreng. ex DC. subsp. glauca
Clypeola jonthlaspi L.
Draba verna L.
Pseudoturritis turrita (L.) Al-Shehbaz
Sinapis pubescens L. subsp. pubescens

CAMPANULACEAE
Asyneuma trichocalycinum (Ten.) K.Malý
Jasione montana L.

CARYOPHYLLACEAE
Cerastium semidecandrum L.
Cerastium tomentosum L.
Dianthus brutius Brullo, Scelsi & Spamp. subsp. brutius
Herniaria glabra L.
Moehringia trinervia (L.) Clairv.
Petrorhagia saxifraga (L.) Link subsp. gasparrinii (Guss.) Pignatti ex Greuter & Burde
Sagina hawaiensis Pax
Scleranthus annuus L.
Scleranthus perennis L. subsp. marginatus (Guss.) Nyman
Silene gallica L.
Silene italica (L.) Pers. subsp. sicula (Ucria) Jeanm.
Silene vulgaris (Moench) Garcke subsp. commutata (Guss.) Hayek
Stellaria nemorum L. subsp. montana (Pierrat) Berhe

CISTACEAE
Cistus salviifolius L.
Helianthemum nummularium (L.) Mill. subsp. tomentosum (Scop.) Schinz & Thell.
Tuberaria guttata (L.) Fourr.

CRASSULACEAE
Petrosedum tenuifolium (Sm.) Grulich
Sedum annuum L.
Sedum cepaea L.
Sedum dasyphyllum L.
Umbilicus rupestris (Salisb.) Dandy

CYPERACEAE
Carex pendula Huds.
Carex remota L.
Carex sylvatica Huds.

ERICACEAE
Erica arborea L.
Monotropa hypopitys L.
Orthilia secunda (L.) House
Pyrola minor L.

EUPHORBIACEAE
Euphorbia meuselii Geltman
Euphorbia characias L.
Euphorbia corallioides L.
Euphorbia rigida M.Bieb.

FABACEAE
Adenocarpus complicatus (L.) J.Gay subsp. brutius (Brullo, De Marco & Siracusa) Peruzzi & Bernardo
Anthyllis vulneraria L. subsp. maura (Beck) Maire
Cytisus infestus (C.Presl) Guss. subsp. infestus
Cytisus scoparius (L.) Link subsp. scoparius
Cytisus villosus Pourr.
Genista brutia Brullo, Scelsi et Spamp.
Genista sagittalis L.
Genista tinctoria L.
Lathyrus grandiflorus Sm.
Lathyrus pratensis L.
Lathyrus venetus (Mill.) Wohlf.
Lotus corniculatus L.
Medicago lupulina L.
Trifolium incarnatum L. subsp. molinerii (Hornem.) Syme
Trifolium ochroleucon Huds.
Trifolium pratense L. subsp. semipurpureum (Strobl) Pignatti
Trifolium repens L.
Vicia cassubica L.
Vicia sativa L.

FAGACEAE
Castanea sativa Mill.
Fagus sylvatica L.
Quercus ilex L.
Quercus petraea (Matt.) Liebl. subsp. austrotyrrhenica Brullo, Guarino & Siracusa
Quercus pubescens Willd. subsp. pubescens

GENTIANACEAE
Centaurium erythraea Rafn subsp. erythraea

GERANIACEAE
Geranium pyrenaicum Burm.f. subsp. pyrenaicum
Geranium purpureum Vill.
Geranium robertianum L.
Geranium rotundifolium L.
Geranium versicolor L.

HYPERICACEAE
Hypericum androsaemum L.
Hypericum barbatum Jacq. subsp. calabricum (Spreng.) Peruzzi & N.G.Passal.
Hypericum tetrapterum Fr.

IRIDACEAE
Crocus longiflorus Raf.
Romulea bulbocodium (L.) Sebast. & Mauri

JUNCACEAE
Juncus articulatus L.
Juncus effusus L.
Juncus inflexus L.

Luzula forsteri (Sm.) DC.
Luzula sylvatica (Huds.) Gaudin. subsp. sicula (Parl.) K.Richt

LAMIACEAE
Ajuga reptans L.
Ajuga tenorei C.Presl
Clinopodium grandiflorum (L.) Kuntze
Clinopodium nepeta (L.) Kuntze
Clinopodium vulgare L. subsp. arundanum (Boiss.) Nyman
Lamium flexuosum Ten. subsp. flexuosum
Lamium galeobdolon (L.) L. subsp. montanum (Pers.) Hayek
Lycopus europaeus L.
Mentha aquatica L. subsp. aquatica
Micromeria graeca (L.) Benth. ex Rchb. subsp. tenuifolia (Ten.) Nyman
Prunella laciniata (L.) L.
Prunella vulgaris L.
Stachys sylvatica L.
Stachys tymphaea Hausskn.
Teucrium siculum (Raf.) Guss. subsp. siculum
Thymus longicaulis C.Presl subsp. longicaulis
Ziziphora granatensis (Boiss. & Reut.) Melnikov subsp. granatensis

LYTHRACEAE
Peplis portula L.

MALVACEAE
Malva moschata L.

ONAGRACEAE
Chamaenerion angustifolium (L.) Scop.
Circaea lutetiana L.
Epilobium hirsutum L.
Epilobium lanceolatum Sebast. & Mauri
Epilobium montanum L.
Epilobium parviflorum Schreb.
Epilobium tetragonum L. subsp. lamyi (F.W.Schultz) Nyman

ORCHIDACEAE
Anacamptis morio (L.) R.M.Bateman, Pridgeon & M.W.Chase
Anacamptis papilionacea (L.) R.M.Bateman, Pridgeon & M.W.Chase
Dactylorhiza maculata (L.) Soó subsp. saccifera (Brongn.) Diklic
Dactylorhiza sambucina (L.) Soó
Epipactis aspromontana Bartolo, Pulv. & Robatsch
Epipactis meridionalis H.Baumann & R.Lorenz
Epipactis microphylla (Ehrh.) Sw.
Epipogium aphyllum Sw.
Limodorum brulloi Bartolo & Pulv.
Neottia nidus-avis (L.) Rich.
Orchis anthropophora (L.) All.
Platanthera chlorantha (Custer) Rchb.

OROBANCHACEAE
Bellardia viscosa (L.) Fisch. & C.A.Mey.
Lathraea clandestina L.
Lathraea squamaria L.
Pedicularis comosa L. subsp. comosa
Rhynchocorys elephas (L.) Griseb.

OXALIDACEAE
Oxalis acetosella L.

PAPAVERACEAE
Corydalis densiflora C.Presl subsp. densiflora

PLANTAGINACEAE
Digitalis micrantha Roth ex Schweigg.
Digitalis purpurea L.
Linaria purpurea (L.) Mill.
Plantago bellardi All. subsp. bellardi
Plantago humilis Jan ex Guss.
Plantago lanceolata L.
Plantago major L.
Veronica anagallis-aquatica L. subsp. anagallis-aquatica
Veronica arvensis L.
Veronica beccabunga L. subsp. beccabunga
Veronica montana L.
Veronica officinalis L.
Veronica serpyllifolia L.

PLUMBAGINACEAE
Armeria aspromontana Brullo, Scelsi & Spamp.

POACEAE
Agrostis canina L.
Agrostis stolonifera L.
Aira caryophyllea L.
Anthoxanthum odoratum L.
Avenella flexuosa (L.) Drejer subsp. flexuosa
Brachypodium sylvaticum (Huds.) P.Beauv.
Bromopsis erecta (Huds.) Fourr.
Bromus hordeaceus L.
Cynosurus cristatus L.
Cynosurus echinatus L.
Cynosurus elegans Desf.
Dactylis glomerata L.
Deschampsia cespitosa (L.) P.Beauv.
Drymochloa drymeja (Mert. & W.D.J.Koch) Holub.
Festuca marginata (Hack.) K.Richt. subsp. marginata
Festuca heterophylla Lam.
Festuca rubra L.
Festuca trichophylla (Ducros ex Gaudin) K.Richt.
Festuca trichophylla (Gaudin) Richt. subsp. asperifolia
Holcus lanatus L. subsp. lanatus
Koeleria splendens C.Presl
Lolium perenne L.
Macrobriza maxima (L.) Tzvelev.
Melica uniflora Retz.
Milium effusum L.
Milium montianum Parl.
Nardus stricta L.
Patzkea paniculata (L.) G.H.Loos subsp. paniculata
Phleum hirsutum Honck. subsp. ambiguum (Ten.) Cif. & Giacom.
Poa alpina L.

Poa bulbosa L.
Poa sylvicola Guss.
Poa trivialis L.

POLYGALACEAE
Polygala alpestris Rchb.
Polygala monspeliaca L.

POLYGONACEAE
Rumex acetosella L.
Rumex bucephalophorus L.
Rumex pulcher L. subsp. pulcher
Rumex sanguineus L.

PORTULACACEAE
Montia arvensis Wallr.
Rumex scutatus L.

PRIMULACEAE
Cyclamen hederifolium Aiton
Cyclamen repandum Sm. & Sibth.
Lysimachia nemorum L.
Primula vulgaris Huds.
Soldanella calabrella Kress

RANUNCULACEAE
Aconitum lycoctonum L. emend. Koelle
Anemone apennina L.
Aquilegia dumeticola Jord.
Clematis vitalba L.
Ficaria verna Huds.
Ranunculus fontanus C.Presl
Ranunculus millefoliatus Vahl
Ranunculus ophioglossifolius Vill.
Ranunculus sardous Crantz

ROSACEAE
Alchemilla austroitalica Brullo, Scelsi & Spamp.
Aremonia agrimonoides (L.) DC. subsp. agrimonoides
Crataegus monogyna Jacq.
Fragaria vesca L.
Geum urbanum L.
Malus sylvestris Mill.
Potentilla calabra Ten.
Potentilla erecta (L.) Raeusch.
Potentilla micrantha Ramond ex DC.
Rosa canina L.
Rosa heckeliana Tratt.
Rubus canescens DC.
Rubus hirtus Waldst. & Kit. group
Rubus idaeus L. subsp. idaeus
Sorbus aucuparia L.
Sorbus torminalis (L.) Crantz

RUBIACEAE
Asperula taurina L.
Cruciata pedemontana (Bellardi) Ehrend.
Galium album Mill.
Galium aparine L.
Galium corrudifolium Vill.
Galium laevigatum L.
Galium odoratum (L.) Scop.
Galium rotundifolium L. subsp. rotundifolium
Galium verum L.
Sherardia arvensis L.

SALICACEAE
Populus tremula L.
Salix alba L.
Salix brutia Brullo & Spamp.
Salix caprea L.
Salix oropotamica Brullo, Scelsi & Spamp.

SANTALACEAE
Thesium humile Vahl
Viscum album L. subsp. abietis (Wiesb.) Janch.
Viscum album L. subsp. album

SAXIFRAGACEAE
Chrysosplenium dubium J.Gay ex Ser.
Saxifraga rotundifolia L. subsp. rotundifolia
Saxifraga tridactylites L.

SCROPHULARIACEAE
Scrophularia scopolii Hoppe ex Pers.
Verbascum sinuatum L.
Verbascum thapsus L.

SOLANACEAE
Atropa belladonna L.

THYMELAEACEAE
Daphne laureola L.

URTICACEAE
Urtica dioica L.

VIBURNACEAE
Sambucus ebulus L.
Sambucus nigra L.

VIOLACEAE
Viola aethnensis (Ging. & DC.) Strobl subsp. messanensis (W.Becker) Merxm. & Lippert
Viola alba Besser subsp. dehnhardtii (Ten.) W.Becker
Viola reichenbachiana Jord. ex Boreau
Viola riviniana Rchb

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TABELLE

Tab. 1 - Galio hirsuti-Fagetum

Superficie (mq)	200
Quota (m slm)	1400
Copertura str. arboreo (%)	100
Copertura str. arbustivo (%)	40
Copertura str. erbaceo (%)	50
Inclinazione (°)	50
Esposizione	N
Car. Associazione	
Galium rotundifolium subsp. *hirsutum*	+
Epipactis meridionalis	+
Limodorum brulloi	+
Diff. Variante	
Abies alba subsp. *apennina*	2
Car. Alleanza	
Anemone apennina	+
Geranium versicolor	1
Drymochloa drymeja	2
Lamium flexuosum subsp. *pubescens*	+
Luzula sylvatica subsp. *sicula*	+
Car. Ordine e Classe	
Fagus sylvatica	5
Mycelis muralis	+
Digitalis micrantha	1
Potentilla micrantha	+
Rubus hirtus	1
Festuca heterophylla	1
Brachypodium sylvaticum	+
Hieracium lachenalii	+
Aremonia agrimonioides	+
Geranium robertianum	+
Symphytum bulbosum	.
Ilex aquifolium	+
Monotropa hypopitys	+
Clinopodium vulgare subsp. *arundanum*	+
Lathyrus venetus	2
Orthilia secunda	+
Polystichum setiferum	+
Galium rotundifolium subsp. *rotundifolium*	+
Neottia nidus-avis	+
Lathyrus pratensis	+
Stellaria nemorum subsp. *montana*	+
Altre specie	
Galium album	1
Pteridium aquilinum	+
Cardamine glauca	+
Trifolium pratense subsp. *semipurpureum*	+
Polypodium vulgare	+

Tab. 2 - ***Hypochoerido-Pinetum calabricae***

Superficie (mq)	200
Quota (m slm)	1500
Copertura strato arboreo (%)	70
Copertura strato arbustivo (%)	20
Copertura strato erbaceo (%)	80
Inclinazione (°)	30
Esposizione	S
Car. Associazione	
Pinus nigra subsp. *laricio* var. *calabrica*	4
Hypochaeris laevigata	2
Car. Alleanza	
Anemone apennina	1
Luzula sylvatica subsp. *sicula*	+
Car. Ordine e Classe	
Euphorbia meuselii	2
Galium rotundifolium subsp. *hirsutum*	3
Aremonia agrimonoides	2
Fagus sylvatica	2
Lathyrus pratensis	1
Digitalis micrantha	+
Viola reichenbachiana	+
Rubus hirtus	+
Sanicula europaea	+
Altre specie	
Pteridium aquilinum	4
Teucrium siculum	+
Festuca trichophylla subsp. *asperifolia*	1
Pimpinella anisoides	1
Bromopsis erecta	2
Dactylis glomerata subsp. *glomerata*	1
Anthoxanthum odoratum	+
Fragaria vesca	1
Crepis leontodontoides	1
Thymus longicaulis	+
Helianthemum nummularium subsp. *tomentosum*	+
Cytisus scoparius	1

Tab. 3 - *Cytisetum villoso-scoparii*

Quota (m slm)	810
Superficie (mq)	30
Copertura (%)	90
Inclinazione (°)	30
Esposizione	NE
Car. Associazione	
Cytisus villosus	3
Car. Alleanza	
Thymus longicaulis	1
Micromeria graeca subsp. *tenuifolia*	1
Car. Ordine e Classe	
Cytisus scoparius	2
Erica arborea	4
Pteridium aquilinum	+
Altre specie	
Dactylis glomerata subsp. *glomerata*	1
Cistus salviifolius	2
Galium album	1
Silene italica subsp. *sicula*	1
Quercus ilex	1
Calamintha nepeta	1
Helichrysum italicum	+
Rumex multifidus	+
Daucus carota	+
Luzula forsteri	+
Crepis leontodontoides	+
Pulicaria odora	+
Briza maxima	1
Calicotome infesta	2

Tab. 4 – *Euphorbio corallioidi-Alnetum glutinosae*

Quota (m slm)	1320
Superficie (mq)	100
Copertura strato arboreo (%)	90
Copertura strato arbustivo (%)	20
Copertura strato erbaceo (%)	50
Inclinazione (°)	-
Car. Associazione	
Euphorbia corallioides	1
Car. Alleanza e Ordine	
Alnus glutinosa	5
Athyrium filix-foemina	1
Carex remota	+
Car. Classe	
Festuca heterophylla	2
Geranium versicolor	1
Fagus sylvatica	1
Brachypodium sylvaticum	1
Hypericum androsaemum	+
Mycelis muralis	+
Galium rotundifolium subsp. *hirsutum*	+
Luzula sieberi	+
Viola reichenbachiana	+
Abies alba	+
Altre specie	
Pteridium aquilinum	1
Viola alba subsp. *dehnhardtii*	+
Lereschia thomasii	+
Prunella vulgaris	+
Luzula forsteri	+
Galium album	+
Dactylorhiza saccifera	+

Tab. 5 - *Veronico beccabungae-Ranunculetum ophioglossifolii*

Quota (m slm)	1400
Superficie (mq)	1
Copertura (%)	90
Car. Associazione	
Ranunculus ophioglossifolius	3
Car. Alleanza, Ordine e Classe	
Veronica beccabunga	2
Cardamine flexuosa	+
Sagina saginoides	+
Altre specie	
Juncus articulatus	1
Glyceria spicata	1
Epilobium tetragonum subsp. *lamyi*	+

Tab. 6 - *Petasito-Chaerophylletum calabrici*

Numero del rilievo	1	2
Quota (m slm)	1400	1620
Superficie (mq)	10	10
Copertura (%)	90	100
Car. Associazione		
Chaerophyllum hirsutum var. *calabricum*	2	3
Petasites albus	4	3
Epipactis aspromontana	.	1
Car. Alleanza e Ordine		
Mycelis muralis	1	+
Athyrium filix-foemina	2	2
Geranium robertianum	+	+
Stachys sylvatica	1	.
Epilobium montanum	+	.
Car. Classe		
Poa trivialis	.	1
Urtica dioica	1	2
Altre specie		
Geranium versicolor	2	1
Brachypodium sylvaticum	1	.
Trifolium pratense subsp. *semipurpureum*	.	+
Dactylis glomerata	.	+
Cryptotaenia thomasii	.	+
Rubus hirtus	2	.
Crepis leontodontoides	.	+
Lathyrus venetus	1	.
Moehringia trinervia	+	.
Aremonia agrimonioides	+	.
Solidago virga-aurea	1	.

Tab. 7 - *Armerio aspromontanae-Potentilletum calabrae*

Quota (m slm)	1650
Superficie (mq)	50
Copertura (%)	90
Inclinazione (°)	-
Esposizione	-
Car. Associazione	
Potentilla calabrica	2
Lotus corniculatus	1
Car. Alleanza	
Armeria aspromontana	2
Centaurea poltiana	2
Car. Ordine	
Anthemis cretica subsp. *calabra*	2
Car. Classe	
Bunium petraeum	1
Petrorhagia saxifraga subsp. *gasparrinii*	1
Scleranthus perennis subsp. *marginatus*	2
Ziziphora granatensis subsp. *alpina*	2
Rumex multifidus	+
Herniaria microcarpa	+
Altre specie	
Plantago lanceolata var. *sphaerostachya*	2
Helianthemum nummularium subsp. *tomentosum*	2
Festuca circummediterranea	2
Sedum amplexicaule	2
Poa bulbosa	1
Anthyllis vulneraria subsp. *maura*	1
Trifolium ochroleucum	1
Cynosurus echinatus	+
Aira caryophyllea	+
Bellis perennis	1
Galium album	1
Anthemis arvensis subsp. *sphacelata*	1
Allium paniculatum	1
Hypochaeris urens	+

Tab. 8 - *Campanulo trichocalycinae-Fagetum sylvaticae*

Quota (m slm)	1820
Superficie (mq)	100
Coper. str. arboreo-arb. (%)	100
Coper. str. erbaceo (%)	40
Inclinazione (°)	20
Esposizione	N
Car. Associazione	
Silene vulgaris subsp. *commutata*	2
Cardamine chelidonia	+
Car. Alleanza	
Campanula trichocalycina	2
Orthilia secunda	+
Car. Ordine e Classe	
Fagus sylvatica	5
Luzula sicula	1
Abies alba var. *apennina*	+
Lamium flexuosum subsp. *pubescens*	+
Scilla bifolia	+
Galium rotundifolium subsp. *rotundifolium*	2
Hieracium lachenalii	+
Galium laevigatum	1
Altre specie	
Bellis perennis	2
Veronica officinalis	+

Tab. 10 - *Scleranto-Sedetum gussonei*

Quota (m)	1550
Superficie (mq)	1
Copertura (%)	80
Car. Associazione	
Sedum annuum subsp. gussonei	2
Car. Alleanza	
Scleranthus annuus	2
Erophila verna subsp. *praecox*	2
Veronica arvensis	2
Car. Ordine e Classe	
Aira caryophyllea	3
Cerastium semidecandrum	+
Cynosurus echinatus	1
Silene gallica	1
Altre specie	
Poa bulbosa	2
Sedum amplexicaule	1
Rumex multifidus	1
Bromus hordeaceus	1

Tab. 9 - *Junipero hemisphaericae-Abietetum apenninae*

Numero del rilievo	1	2
Quota (m slm)	1600	1700
Superficie (mq)	50	100
Copert. str. arboreo (%)	70	70
Copert. str. arbustivo (%)	50	60
Copert. str. erbaceo (%)	50	40
Inclinazione (°)	20	10
Esposizione	S	S
Diff. Associazione		
Abies alba subsp. *apennina*	3	4
Car. Alleanza		
Pinus nigra subsp. *laricio* var. *calabrica*	2	.
Car. Ordine e Classe		
Juniperus communis subsp. *hemisphaerica*	3	3
Altre specie		
Fagus sylvatica	1	2
Cytisus scoparius	1	2
Adenocarpus brutius	+	+
Helianthemum nummularium subsp. *tomentosum*	1	2
Anthemis cretica susp. *calabra*	+	1
Hypochoeris laevigata	2	1
Festuca circummediterranea	2	2
Sedum tenuifolium	2	2
Centaurea poltiana	+	1
Ziziphora granatensis subsp. *granatensis*	1	1
Hieracium macranthum	+	.
Dactylorhiza sambucina	.	+
Bellis perennis var. *aspromontana*	2	2
Silene italica subsp. *sicula*	2	+
Leontodon cichoriaceus	1	+
Trifolium pratense subsp. *semipurpureum*	1	+
Plantago lanceolata	1	1
Muscari atlanticum	+	+
Ranunculus millefoliatus	1	+
Quercus petraea subsp. *austrotyrrenica*	.	1
Poa bulbosa	1	+
Petrorhagia saxifraga subsp. *gasparrinii*	+	.
Viscum album	.	+
Digitalis micrantha	+	.

Tab. 11 - *Rhynchocorytho-Alchemilletum austroitalicae*

Quota (m slm)	1520
Superficie (mq)	5
Copertura (%)	100
Car. Associazione	
Alchemilla austroitalica	3
Rhynchocorys elephas	1
Car. Alleanza, Ordine e Classe	
Cynosurus cristatus	1
Prunella vulgaris	+
Dactylorhiza saccifera	+
Epilobium tetragonum subsp. *lamyi*	1
Carex ovata	1
Altre specie	
Athyrium filix-foemina	2
Bryum pseudotriquetrum	2
Chaerophyllum hirsutum var. *calabricum*	3
Solidago virgaurea	1
Petasites albus	1
Saxifraga rotundifolia fo. *repanda*	1
Festuca trichophylla subsp. *trichophylla*	1
Philonotis fontana	1

Tab. 12 - *Adenostylo-Soldanelletum calabrellae*

(*Caricion remotae, Montio-Cardaminetalia, Montio-Cardaminetea*)

Quota (m slm)	1550
Superficie (mq)	20
Copertura (%)	90
Inclinazione (°)	80
Car. Associazione	
Soldanella calabrella	2
Adenostyles alpina subsp. *macrocephala*	+
Car. Alleanza, Ordine e Classe	
Mnium punctatum	1
Pellia epiphylla	+
Sagina saginoides	3
Bryum pseudotriquetrum	+
Altre specie	
Prunella vulgaris	1
Chaerophyllum hirsutum var. *calabricum*	1
Atrichum undulatum	1
Cystopteris fragilis	1

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