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NATIONAL BIODIVERSITY FUTURE CENTER

UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA

19•22 MAGGIO 2025
Università degli Studi di Milano-Bicocca
Triennale Milano

FORUM NAZIONALE DELLA BIODIVERSITÀ

(La biodiversità è la soluzione)

FORUM NAZIONALE DELLA BIODIVERSITÀ

Book of Abstracts

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National Biodiversity Forum

Biodiversity is the answer

The “National Biodiversity Forum 2025”, hosted by University of Milano - Bicocca, brought together scientists, lawyers, sociologists, policymakers, artists, and citizens to discuss biodiversity as a driver of innovation, sustainability, and cultural change. The event took place across multiple days and venues, offering a rich and interdisciplinary program.

The opening day featured institutional greetings and a keynote conversation between Marco Paolini and Telmo Pievani, highlighting how biodiversity can be communicated through culture and storytelling. This was followed by presentations on the current achievements of NBFC and its role in addressing global environmental challenges.

Throughout the sessions, speakers explored biodiversity from numerous angles:

- *Scientific Research*: Presentations showcased tools and research for restoration, conservation, monitoring and valorization of biodiversity, ecological modeling, genetic studies, and solutions for marine and urban ecosystems.

- *Law & Policy*: Experts addressed European biodiversity obligations, protected areas, and the value of ecosystem services within legal frameworks.

- *Citizen Science*: Several projects illustrated how the public can actively contribute to biodiversity monitoring and conservation.

- *Technology*: Innovations such as data platforms, modeling tools, and digitized natural history collections were presented as essential for future biodiversity management.

- *Education & Communication*: Sessions emphasized the importance of involving youth, educators, and the public through accessible and creative approaches, including comics and museum-based initiatives.

- *Economy*: Researchers and businesses discussed how biodiversity can support sustainable production, from fungal bioremediation to plant-based nutraceuticals.

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National Biodiversity Forum

Biodiversity is the answer

During the conference the Biodiversity Gateway was presented, a strategic digital platform designed to connect researchers, institutions, and citizens.
One of the most significant moments was the performance of Il Terzo Paradiso led by Michelangelo Pistoletto, blending art, nature, and civic participation.
he final day, hosted at the Triennale di Milano, focused on the theme of biodiversity and inequalities. Discussions examined the relationship between biodiversity loss and social disparity, gender issues, and youth involvement in research. The conference closed with reflections on the future of European biodiversity research.
Overall, the conference successfully highlighted how biodiversity is not only a scientific and ecological concern, but also a cultural, political, and social one, requiring integrated approaches and shared responsibility.

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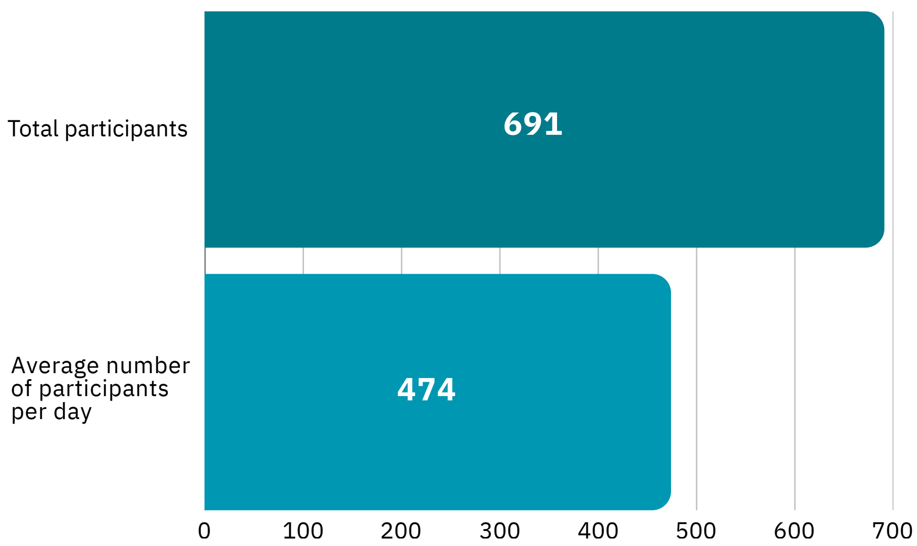
Forum statistics

Attendance



Where

2 Locations - University of Milano-Bicocca and Triennale Milano

Who

22 Notable guests

2 National artists

3 Content creators/science communicators

26 Agencies, Institutions, and National Parks

20 Representatives of Foundations and Non-Profit Associations

45 Company representatives

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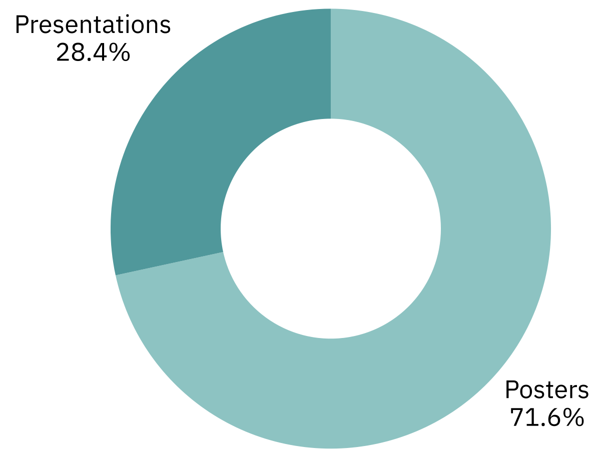
Forum statistics

Content



338 Total contributions
242 Posters
96 Presentations

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Photos

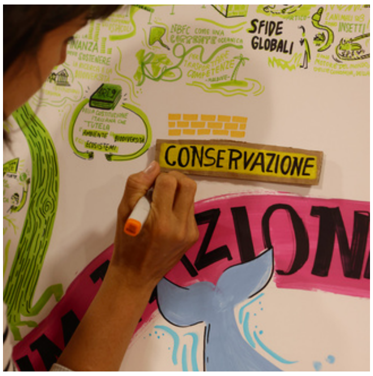








Photos



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Art and science

Art as an engine of transformation for a sustainable world

Michelangelo Pistoletto

Michelangelo Pistoletto, born in Biella in 1933, is a central figure in contemporary art, known for his innovative approach and his exploration of identity and society. With his *Mirror Paintings*, he revolutionized the perception of art by directly involving the viewer in the artwork. In the 1960s, through the Arte Povera movement, he challenged traditional materials, opening up new expressive possibilities.

His artistic vision has always carried a strong social dimension, culminating in the founding of Cittadellarte–Fondazione Pistoletto, a center dedicated to cultural and environmental transformation. At the heart of his thinking is the concept of the *Third Paradise*, a symbol representing the need for balance between nature and technology—a new pact between humanity and the environment.

Pistoletto has brought his ecological commitment into institutional contexts as well, participating in the **National Biodiversity Forum**, where he highlighted the connection between art, science, and sustainability. His work intersects with scientific research on the protection of the planet, demonstrating how art can serve as a tool for raising awareness and driving change. His attention to nature is also evident in his artistic projects. His commitment has earned him numerous accolades, including the Golden Lion for Lifetime Achievement and the Wolf Foundation Prize in Arts—awards that testify to the global significance of his work.

Art and science

Art as a bridge to science

Alterales

Alessia Iotti (Alterales) is an Italian comic artist, visual reporter, and climate communicator. Through her illustrations, she is committed to explaining climate change in a simple and accessible way, along with the political and community strategies we can implement to take action for the planet and promote climate and social justice. She is the author of the book "La crisi climatica esiste, non è un unicorno" (2023) and "Al lago! Al lago!" (2024), which focuses on biodiversity. She creates illustrations for La Revue and Materia Rinnovabile, and her work appears in newspapers and magazines.

The artist contributed to the **National Biodiversity Forum** by offering an original narrative of the works presented during the three days at Bicocca. Through Alterales' illustrations, research took on a different form, surprising even scientists themselves.

Art and science

Art as a bridge to science

ILLUSTRAZIONI DI ALTERALES

Art and science

A manifesto for biodiversity

Giulia Bernardelli

Giulia Bernardelli is an artist from Mantua, Italy. She studied at the Academy of Fine Arts in Bologna and worked in museums with children. Fascinated by colors and textures, she began creating art using natural materials like leaves, food, and especially coffee. Most of her creations are temporary and bound to disappear. She worked for brands like Fox, Pirelli, Washington Post, Disney, Segafredo, Siemens. The artist created the **National Biodiversity Forum** logo, inspired by Italian biodiversity. With scientific guidance from several scientists, she recreated typical Mediterranean flora and fauna using paper.

A creative emblem of biodiversity

Magda Masano

The artist Magda Masano - graduated in "History and Conservation of Architectural and Environmental Heritage" - is the creator of the brand *Folk*, which designs and produces custom-made pieces. According to an ancient Sicilian folk tradition, the ceramic pine cone is an ornament that should never be missing from a home, as it symbolizes health, good luck, and prosperity. The special “Pigna Pop” series, conceived as a creative emblem of biodiversity, is made from hand-molded terracotta and hand-painted ceramic for the National Biodiversity Future Center on the occasion of the **National Biodiversity Forum**.

Scientific Committee

Directors

Massimo Labra and Alberto Di Minin

Spoke leaders

Gianluca Sarà, Simonetta Fraschetti, Mariachiara Chiantore, Gianmarco Luca, Francesco Frati, Lorenza Rebecchi, Donatella Spano, Carlo Calfapietra, Andrea Galimberti, Maria Chiara Pastore, Hellas Cena, Gloria Bertoli, Isabella Saggio, Luigi Bubacco, Maria Carmela Basile, Giuseppe Gigli

University of Milano-Bicocca Team

Marco Orlandi, Paolo Galli, Paola Branduardi, Paola Coccetti, Alfredo Marra, Monica Guerra, Maurizio Casiraghi, Davide Maggioni, Nunzia Borrelli, Delsignore Monica, Sandra Citterio, Luca Campone, Werther Guidi Nissim, Fabrizio Grassi, Paolo Biella, Jessica Frigerio, Nicola Tommasi, Lorenzo Guzzetti, Stefania Pagliari, Giovanni Zecca, Antonia Bruno, Emily Rose Palm, Rodolfo Gentili, Chiara Montagnani

With the external supervision of

Maria Chiara Carrozza, Telmo Pievani, Stefano Boeri, Marina Calloni

Organizing Committee

General manager

Ilaria Bruni

Program manager

Paola Esena

Communications manager

Martina Bricalli

Institutional relations manager

Chiara Magoni

Presentations

How much do we know about the genetics of Alpine plants?

Adamo Martino[1], Dexter Graham Kyle[1], Boria Soledad Valentina[1], Mucciarelli Marco[1]

1. *Department of Life Sciences and Systems Biology, University of Turin*

Biodiversity loss, accelerated by anthropogenic impact, poses critical ecological, economic, and societal challenges. Genetic diversity, a cornerstone of biodiversity, is pivotal for long-term survival of species. However, its implementation in conservation efforts remains largely underestimated compared to ecosystem and species diversity. This study assesses the current state of genetic knowledge on endemic plants of the Alps. This biodiversity hotspot has unique taxa confined to small geographic ranges. Using the Web of Science database, 689 studies on Alpine endemisms were selected, focusing on phylogeny, cytogenetics, and population genetics. Only one-third of these studies directly address conservation goals. A Genetic Monitoring Effort Index (GMEi) was applied to assess the coverage of the topic and to highlight principal trends. This survey has revealed that recent advancements in genetic techniques, such as high-throughput sequencing, have provided valuable insights in conservation biology. The two most effective methods applied so far are Amplified Fragment Length Polymorphism (AFLP), which is effective with large sample sizes, and ddRAD sequencing, an innovative high-resolution technique exploiting high-throughput sequencing platforms, with a high GMEi. However, genetic studies are still limited by high costs and the need for specialized expertise. Results indicate an urgent need to study genetics of alpine endemic flora in more detail, particularly for species with limited available data, to bridge gaps in knowledge and inform conservation strategies. A coordinated effort to integrate genetic insights into conservation planning, supported by appropriate research incentives and interdisciplinary collaboration, is essential to preserve this invaluable floristic heritage.

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Presentations

Metabolic and flux analysis of non-conventional yeast able to use C2-C4 carbon sources obtained from waste materials – The NCY-13CFlux project

Gennaro Agrimi[1], Eugenia Messina[1], Cosetta Ciliberti[1], Pasquale Scarcia[1], Isabella Pisano[1]

1. *Department of Biosciences, Biotechnologies and Environment, University of Bari Aldo Moro, Campus Universitario, via Orabona 4, 70125 Bari, Italy*

The project NCY-13CFlux aims to develop methodologies for analyzing metabolic fluxes using carbon-13 labeling (13CMFA) and quantitative metabolic analysis (calculation of specific rates and production yields) of unconventional yeast strains that utilize predefined mixtures of C2-C4 compounds as carbon sources. The analysis are carried out to understand how substrates such as short-chain fatty acids generated from anaerobic digestion of organic material or short-chain diols obtained from the depolymerization of traditional or biodegradable plastics can be used by these yeasts and in particular by *Yarrowia lipolytica*. By investigating the natural metabolic biodiversity or that obtained through synthetic biology approaches of unconventional yeasts, the project can contribute to enabling the use of waste as starting material for sustainable industrial production. Metabolic and fluxomic analysis of microbial cells is a fundamental tool for the design and optimization of microbial "cell factories”. The project is fully aligned with the activity 3 of Spoke 6 "Biodiversity and Biotechnology” and is configured both as a research project and as a service to be offered to the NBFC.

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Presentations

Genotoxicity assessment of some selected plant extracts from italian biodiversity

Ghanya Al-Naqeba[1], Rachele De Giuseppe[1], Aliki Kalmpourtzidou[1], Mauro Commisso[2], Linda Avesani[2] and Hellas Cena[1,3]

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3. *Clinical Nutrition Unit, ICS Maugeri IRCCS, 27100 Pavia, Italy*

The increasing interest in the health advantages linked to various plant extracts, along with their economic significance, has led to a heightened demand for comprehensive research, even though there is limited information regarding the genotoxicity of plant extracts that may be detrimental to human health. This study aims to determine cytotoxic, genotoxic and antigenotoxic effects of 5 different plant extracts from Italian biodiversity including, *Cistus monspeliensis, Staphylea pinnata, Petasites paradoxus, Dianthus superbus* and *Actinidia deliciosa*. Genotoxicity was assessed using in vitro cytokinesis-block micronucleus assay in the Chinese Hamster Ovarian K1 cells. Micronucleus scoring was analyzed using an advanced image analysis approach, of fluorescence microscope analysis with ImageStreamX imaging flow cytometer. Based on our experimental conditions, *Cistus monspeliensis* extract showed to be non-genotoxic and exhibited antigenotoxic effects. The genotoxicity of *Staphylea pinnata* and Actinidia deliciosa extracts was influenced by the concentrations used, at the lowest concentrations tested, the extracts showed to be non-genotoxic and exhibited antigenotoxic properties. In contrast, at the highest concentrations tested, the extracts demonstrate genotoxic effects. *Petasites paradoxus* and *Dianthus superbus* extracts showed genotoxic effects.

In conclusion, this study provides important insights into the potential cytotoxic, genotoxic, and antigenotoxic effects of the selected plant extracts derived from Italian biodiversity for the first time. These findings highlight the complex nature of the plant's bioactive compounds, suggesting potential therapeutic applications with careful consideration of dosage. *Cistus monspeliensis* appears to be a promising plant extract for further exploration, as it is safe and non-genotoxic, while also exhibiting antigenotoxic properties.

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Presentations

Enhancing *Posidonia oceanica* restoration with nursery-grown seedlings: a seed-based approach exploiting early life history traits

Adriana Alagna[1,2], Claudia Pezzilli[2,3], Vincenzo Maximiliano Giacalone[2,3], Arturo Zenone[2,5], Giovanni D'Anna[2,6], Fabio Badalamenti[2,5], Carolina Di Napoli[3], Chiara Robello[3],Francesco Pelizza[3], Mariachiara Chiantore[2,3], Valentina Asnaghi[2,3]

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2. *NBFC, National Biodiversity Future Center, Palermo, Viale delle Scienze Ed. 16, 90128 Palermo, Italy*
3. *DISTAV, University of Genoa, Genova, Italy*
4. *Institute for the Anthropic impacts and Sustainability in Marine Environment, IAS-CNR, Capo Granitola, Italy*
5. *Institute for the Anthropic impacts and Sustainability in marine environment, IAS-CNR, Palermo, Italy*
6. *Institute for the Anthropic Impacts and Sustainability in Marine Environment, IAS-CNR, Castellammare del Golfo, Italy*

Seagrasses are habitat-forming organisms providing key ecosystem services in coastal marine environments, including carbon sequestration, habitat provision and water clarification. Active restoration of seagrass meadows is urgently needed to halt and reverse the ongoing decline trend.
Seed-based restoration strategies are increasingly emerging as an effective and sustainable tool contributing to the rehabilitation of seagrass ecosystems. The use of sexual propagules provides ecological, genetic and evolutionary advantages to the restored populations. Additionally, the ability to propagate plants in cultivation systems can significantly increase the yield of the biological material collected in the field reducing potential negative impacts to donor beds.
Here we evaluate the feasibility of a novel *Posidonia oceanica* transplantation techniques that makes use of nursery propagated plants from seeds and takes advantage of specific adaptive traits of P. oceanica juveniles, namely adhesive root hairs, to achieve fast and secure anchorage to specially designed supports. These supports serve as stabilizers during seagrass early life stages.
Posidonia oceanica beach-cast seeds were collected along the northwestern coasts of Sicily and reared in two mesocosms located in Liguria and Sicily, using rocky supports designed to maximize adhesion rate and strength. After six months of cultivation under controlled conditions, seedling survival reached 75% and approximately 95% of the plants spontaneously attached to the rocky holders.

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Plantlets, together with their supports, were transplanted at a restoration site on dead matte. We tested two transplantation periods: winter and spring. After four months, in situ early survival reached 96.8% during the winter season. The experiment is still ongoing.

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Presentations

Past present: Extinction debt of forest mammals from urban areas

Leonardo Ancillotto[1], Giulia Guerri[2], Paolo Agnelli[3], Laura Bonora[2], Martino Maggioni[4], Marco Morabito[2] Emiliano Mori[1]

1. *CNR IRET, Italy*
2. *CNR IBE,Italy*
3. *Museum "La Specola"*
4. *University of Florence, Florence, Italy*

Urban ecological studies increasingly explore the processes shaping wildlife communities in cities. However, most focus on a limited number of taxonomic groups and current landscape structures, leaving critical gaps in our understanding of extinction processes in urban environments. Using the city of Florence and its mammalian fauna as a model, we investigate whether historical habitat availability influences current species presence—providing evidence for extinction debt in urban mammals.

We compiled 1,297 mammal records from Florence spanning 1832 to 2023, representing 62 species. These records were organized into two checklists reflecting key stages in the city's urban development. For each period, we reconstructed land use maps and modeled total species richness, guild-specific richness, and individual species occurrences as functions of both past and present land use and ecological preferences.

Our results show patterns of both local extinction and colonization, with an overall increase in species richness over time. However, forest-specialist mammals exhibited signs of extinction debt, indicating that current diversity levels may decline due to delayed responses to past habitat loss. The long-term perspective revealed clear links between land use dynamics and the persistence of forest species in urban areas.

These findings highlight that current urban mammal assemblages are strongly shaped by time-lagged responses to habitat changes. In particular, forest-associated species may represent "living dead" populations—persisting for now, but at risk of future local extinction without targeted habitat restoration efforts.

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Presentations

Comics and Biodiversity: Engaging New Audiences through Visual Storytelling

Chiara Anzolini[1,2], Fabio De Pascale[1,2], Sofia Belardinelli[1,2], Dietelmo Pievani[1,2]

1. *Department of Biology, University of Padova, Padua, Italy*
2. *NBFC, National Biodiversity Future Center, Palermo, Viale delle Scienze Ed. 16, 90128 Palermo, Italy*

As the biodiversity crisis intensifies, there is a growing need for science communication formats that not only inform, but also emotionally engage audiences and reach those traditionally distant from scientific discourse. Within Spoke 7 of the National Biodiversity Future Center (NBFC), we are experimenting with the expressive potential of comics to foster awareness and reflection on biodiversity loss and environmental responsibility.

This talk presents two recent projects designed to communicate biodiversity through popular comic formats. The first, developed with Topolino, Italy's iconic Disney weekly magazine, featured a special issue for the International Day for Biological Diversity 2024. The story, written and illustrated by Disney professionals in close collaboration with our team, followed an original narrative that highlighted the interdependence between humans and ecosystems. Targeting young readers, this project successfully merged entertainment with environmental education.

The second initiative, part of the Comics&Science series published by CNR Edizioni, targets teenagers and young adults. To ensure narrative depth and scientific accuracy, the creative team was immersed in field visits to key research sites, including the Hydrobiological Station of Chioggia and the Botanical Garden of the University of Padova. The result is a story that tackles complex topics – such as anthropogenic impacts, ecosystem fragility, and human well-being – through engaging visual storytelling.

By combining scientific content with artistic creativity, these projects illustrate the power of comics to support emotional engagement, enhance accessibility, and stimulate a participatory dialogue around biodiversity, particularly among audiences not typically reached by traditional science outreach.

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The projects are conceived as a mosaic of complementary formats and target audiences: illustrated books for children and parents, educational activities co-designed with schools for students aged 6 to 14, discussion-based role-playing games for teenagers and adults, science comics for younger and “nerdy” audiences, as well as exhibitions, films, and podcasts aimed at families, tourists, and visual media enthusiasts. Collaborations with popular publishers and national magazines help extend the reach to a broader lay public.

In addition to producing content, Spoke 7 offers science communication training for NBFC researchers and coordinates all external communication activities, including press office activities and social media management. A strong emphasis is placed on impact assessment: surveys and other tools, developed in collaboration with sociology teams, are used to evaluate the effectiveness and reach of each initiative.

By integrating creative storytelling, inclusive outreach strategies, and evidence-based evaluation, Spoke 7 contributes to redefining the role of science in democratic societies, promoting not only awareness but also active and informed public participation to respond to the biodiversity crisis.

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Presentations

Revitalizing urban landscapes: professional guidelines and the FlorTree WebApp for developing air pollution-free cities

Barbara Baesso Moura[1,2], Yasutomo Hoshika[1,2], Jacopo Manzini[2], Elena Paoletti[1,2]

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Air pollution in urban areas is an environmental issue that requires mitigation strategies. Implementing urban green infrastructure is a practical approach to decreasing air pollution, as some tree species are remarkably capable of trapping airborne pollutants due to characteristics like high canopy density, long foliage lifespan, water use efficiency, and high stomatal conductance. However, some species may release volatile organic compounds (VOC_s) that promote the formation of ground-level ozone (O_3) and aerosols. We present comprehensive guidelines for optimal tree selection to empower urban planners, policymakers, and citizens in designing adequate green infrastructures for air quality improvement. These guidelines provide evidence-based recommendations for selecting species with favorable traits that maximize pollutant removal while minimizing VOC emissions. Complementing these guidelines, there will be the launch of the innovative FlorTree WebApp, which results from a collaborative effort involving experts from various fields to optimize species selection. The FlorTree WebApp consolidates scientific data on over 200 tree and shrub species, assessing their capacity to remove key pollutants (PM_{10}, NO_2, and O_3). The guidelines and FlorTree App offer a robust, data-driven platform for urban green planning, enabling personalized strategies to mitigate urban air pollution and enhance public health. This initiative aligns with broader strategies for biodiversity conservation and urban resilience, illustrating how integrating innovative digital tools and the power of nature can lead to healthier and more sustainable urban environments.

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Presentations

Empowering marine biodiversity conservation through citizen science: insights from whale watching experiences across Europe

Eleonora Barbaccia, Lauren Kelly Rodriguez, Belén Ovide García, Gabualdi Mario, Enrico Villa, Maddalena Jahoda, Marianne Helene Rasmussen, Caterina Lanfredi, Michael Traugott, Bettina Thalinger, Arianna Azzellino

As marine biodiversity faces mounting pressures from climate change, pollution, and human activity, inclusive strategies are needed to foster societal engagement in conservation. Within the Biodiversa+ eWHALE project, we explored how the integration of citizen science—in particular, environmental DNA (eDNA) sampling—into whale watching activities influences participants' awareness and conservation behaviour. Conducted in the Western Mediterranean Sea, Iceland, and the Azores, our study involved 224 survey respondents engaged during the 2024 whale watching season. Factor and cluster analyses identified five distinct participant profiles, while logistic regression revealed environmental education and awareness as strong predictors of willingness to pay (WTP) for marine conservation. Notably, 80% of participants were willing to financially support marine biodiversity initiatives, motivated by the educational value of the experience. This research demonstrates how participatory approaches can generate measurable impacts in terms of knowledge dissemination, behavioural change, and support for biodiversity protection. It aligns with the National Biodiversity Future Center's mission to promote innovation and citizen involvement as key levers for conservation and value generation, suggesting that such hybrid models of tourism and science represent a replicable strategy to support marine ecosystems at national and European levels.

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Presentations

Climate-driven shift in mediterranean hydrozoan assemblage: a 50-year study Running

Simona Moglia[1], Federico Betti[1], Ferdinando Boero[2], Martina Canessa[1], Cristina Gioia Di Camillo[3], Francesco Enrichetti[1], Stefania Puce[3], Giorgio Bavestrello[1]

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3. *Department of Life and Environmental Sciences (DiSVA), Polytechnic University of Marche, Via Brecce Bianche, 60131 Ancona, Italy*

Temporal shifts in marine assemblages are well documented for conspicuous habitat-forming organisms, while long-term data on inconspicuous, cryptic taxa like hydrozoans remain limited. Due to their marked seasonal behaviour, hydroids are particularly sensitive to environmental changes, making them ideal indicators of ecosystem responses to climate change.
This study analyzes variations in species composition, bathymetric distribution, seasonality, and reproductive patterns of a hydroid community along the rocky cliff of the Portofino Promontory (Ligurian Sea) over a 44-year period. The original survey, conducted monthly in 1980 along a 0–20 m depth transect, was replicated in 2004 and again in 2024 using the same methodology.
Species richness markedly declined, from 82 species in 1980 to 71 in 2004 and 42 in 2024. Losses were most evident in summer, with no more than 10 species observed. Several winter-dominant taxa, such as *Sertularella crassicaulis, Ectopleura larynx*, and various corynids, have disappeared. In contrast, summer species like Eudendrium racemosum are now perennial. New records include *Acryptolaria conferta*, absent in both 1980 and 2004 and now common in winter, and the southern thermophilic species such as *Corydendrium parasiticum* and *Pennaria disticha*. In general the reproductive periods have shortened and gonophore presence has declined, indicating a reduced incidence of sexual reproduction.
Overall, the community exhibits increasing seasonal and bathymetric homogenization, consistent with warming-driven ecological shifts. This unique long-term dataset offers a rare temporal benchmark for assessing climate change impacts on Mediterranean benthic ecosystems and highlights the vulnerability of hydroid assemblages to ocean warming.

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Presentations

Analysis of the effects of chronic fishing disturbance on community trophic structure and niche: a functional traits approach

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Bottom trawling is one of the major anthropogenic disturbances to marine ecosystems, altering sediment composition, causing habitat degradation and biodiversity loss. Understanding its ecological impact is key to guiding sustainable management. Here we evaluated the effects of bottom trawling on the trophic ecology of benthic and demersal communities in the southern Strait of Sicily, one of the most exploited fishing areas in the Mediterranean Sea. We combined stable isotope analysis with a trait-based ecosystem approach to assess trophic niche width and food web structure along a gradient of fishing intensity, measured as swept area ratio (0.36–37.37). Functional traits were extracted for all species and used in a k-means cluster analysis, identifying six main ecological groups. Isotopic metrics, including convex hulls and Bayesian Layman's metrics, revealed differences in trophic structure between depth categories (50–100 m vs. 100–150 m) and among functional clusters. Our results highlight how long-term exploitation alters environmental variables influencing food web dynamics and functional differentiation. The integration of trait-based and isotopic approaches proved effective in detecting subtle but ecologically relevant changes, offering valuable insights into community resilience and vulnerability in heavily exploited marine ecosystems.

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Presentations

Challenges and Potential of Digitizing Natural History Collections in Italy

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Natural history collections play a vital role in biodiversity conservation, climate monitoring, and public health protection. However, challenges such as the loss of historical collections in museums, the crisis in taxonomic research, and the decline of sampling activities have compromised their integrity. In the last decades, digitisation offered some solutions to these issues. Many projects of digitization of natural history collections are now underway all around the world in order to better enhance our knowledge and accessibility to them, sharing data at a global scale. The oral presentation focuses on the challenges and potential of digitizing natural history collections in Italy, dealing with the fragmentary Italian scenario in a long-term perspective and with a global and transnational approach. According to a recent estimate, in Italy there are approximately 1,700 collections, with a total of around 50 million specimens, only a small portion of which have been cataloged and digitized. The National Biodiversity Future Center is strongly supporting these actions in Italy, for example thanks to the massive digitization of eight Italian herbaria at the University of Florence, coordinated by the University of Padua, using technology from the digitization specialist, Picturae, for a final amount of 4,250,000 specimens and associated metadata or the survey of the Italian natural history collections carried out for NBFC by the Italian Association of Scientific Museums (ANMS). These actions are in support of the future of biodiversity, increasing more coordination and networking among the complex and rich network of natural history museums scattered across Italy.

Presentations

Translating scientific information into concrete actions: A conceptual and operational workflow for active restoration of deep-sea scleractinian cold-water corals (CWC) in two Mediterranean canyons

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Restoring deep-sea ecosystems presents unique challenges due to their remoteness and the limited availability of high-resolution spatial data on marine habitats, critical for effective intervention. Integrating geological, biological, and oceanographic information is essential to assess habitat distribution, identify degradation hotspots, and optimize site selection for restoration actions.
Biodiversity and restoration are a key focus of the National Biodiversity Future Centre (NBFC) and other European projects and programmes. In this framework, a collaborative initiative in 2024 encompassing the EU LIFE DREAM project, the Horizon Europe REDRESS initiative, and NBFC, implemented the first active restoration program for deep-sea cold-water corals (CWCs) in the Mediterranean, targeting sites impacted by marine litter. In the Bari Canyon (Adriatic Sea) and the Dohrn Canyon (Tyrrhenian Sea), 22 artificial structures, designed to facilitate coral colonization, were deployed alongside monitoring sensors.
Here, we present the conceptual workflow underpinning site selection, deployment strategies, and post-restoration monitoring in these canyons. Our contribution showcases the successful translation of scientific data into concrete actions while providing a replicable framework for deep-sea restoration and biodiversity loss mitigation.

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Presentations

Biodiversity and antibiotic resistance study of bacterial communities present in an organics contaminated urban soil of Milan

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Urban soil pollution is an emerging environmental issue with significant implications for ecosystem health and public safety. Among the various pollutants antibiotics, recently considered emerging contaminants, are of particular concern due to their potential to disrupt soil microbial communities and promote the spread of antibiotic resistance (AR). Our study investigates the microbial community structure and AR profiles in an urban brownfield located near a disused railway yard in Milan, Italy. Bulk soil and rhizospheric bacteria were collected from fifteen points representative of a field contaminated by organics. The number of culturable bacteria was estimated via plate counts and taxonomically identified using 16S rRNA gene sequencing, complemented by Next Generation Sequencing (NGS). Approximately 280 bacterial strains were isolated and characterized morphologically and molecularly. Gram-negative bacteria (54%), slightly predominated, with bacilli being the most represented morphology (71.4%). Bacterial abundance was higher in rhizospheric samples, while that of the bulk soil exhibited greater microbial diversity based on Shannon and Simpson indices. All isolates were screened for resistance to five antibiotics (Ampicillin, Tetracycline, Rifampicin, Gentamicin, and Vancomycin) across a concentration gradient (0.2–10,000 µg mL^{-1}). Multidrug resistance was observed in 56.8% of isolates, with total lethality only at high Vancomycin concentrations. Resistant strains were less frequent in the points of the field with the presence of dense vegetation (trees and bushes). Sequencing of selected resistant isolates revealed a large heterogeneity of the analysed community with both different AR and concentration levels.

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Presentations

Citizen science for the conservation of agroecosystems biodiversity

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The CS4Bio project aims to develop an innovative and replicable methodology for monitoring arthropod biodiversity in agroecosystems by integrating Citizen Science into scientific research. The goal is to promote sustainable conservation practices that highlight the role of arthropods in providing essential ecosystem services, such as pollination and biological control. In parallel, the project has a strong educational value: it aims to transfer knowledge and skills to students and citizens, raising awareness of the importance of biodiversity and the environmental impacts of human activities. Finally, CS4Bio envisages the production of scientific publications, technical meetings for farmers and educational materials for schools, encouraging the dissemination of the results and good practices developed.

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Presentations

NbS CataTool: catalogue and planning support tool for Mediterranean Nature-based Solutions

Chiara Catalano[1,2], Giulio Hasanaj[3], Enrico Baglione[4,8], Costanza Carbonari[5], Simona Rinaldi[4], Laura Sandra Leo[4], Mariachiara Chiantore[2,6], Roberto Bologna[3], Chiara Baldacchini[7], Carlo Calfapietra[1,2]

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The Nature-based Solutions Catalogue and Tool (NbS CataTool) of the National Biodiversity Future Center (NBFC) is a multi-stakeholder Decision Support System (DSS) designed to facilitate the uptake and implementation of Nature-based Solutions. The tool offers three functionalities: an NbS selection tool, a Learning tool and a Case study finder, all supported by up to date and agile resources such as synthetic cards and detailed fact sheets.
The NbS CataTool is structured around two interlinked databases: the 'NbS Database' and the 'Case Study Database'. The first is a catalogue of over 100 theoretical NbS systematically categorized by type, ecosystem and domain (urban, terrestrial, marine). These solutions are derived from existing catalogues and scientific literature. The second hosts more than 100 georeferenced NbS case studies from across Italy, sourced from European repositories (e.g., Networknature) and NBFC demonstration sites. Each case study is linked to one or more theoretical NbS based on project characteristics and scale. Both databases use expert defined Key Performance Indicators (KPIs) to evaluate and compare solutions offering measurable insights to support informed decisions.
The NbS selection tool guides users through a four-step process to identify optimal NbS according to their performance toward specific societal challenges.

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The NbS learning tool provides an interactive way to explore theoretical solutions through various filters, while the Case study finder interface enables users to locate and gather information on real-world applications and monitoring outcomes via an interactive map.
The DDS offers dynamic and evolving resources enhancing NbS knowledge sharing and collaborative planning across stakeholders.

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Presentations

Sustainable production of microbial oils and extraction with green solvents

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The agricultural sector is one of the leading producers of agro-industrial solid waste. This waste is mainly disposed of incineration or landfill, representing a huge loss of potential resources to produce high-value chemicals. In the framework of the Agro2Circular (A2C, https://agro2circular.eu/) EU project, we developed a fermentation process for the production of microbial oil destined to the cosmetic industry, using waste lemon extract as starting material. Lemon extract is an aqueous side stream derived from the extraction of polyphenols from waste lemon peel and pulp from the juice industry. The oleaginous yeast *Cutaneotrichosporon oleaginosum* was grown on different lemon extract-based media intended to optimize growth and lipid production; a scale-up to 2L bioreactors allowed to reduce process time compared to multi-well scale and resulted in a lipid accumulation of 47.03% ± 7.9% (goil gCDW-1). We set ourselves the goal to develop a greener and safer downstream method for oil extraction from cellular biomass, finding a valid alternative to the traditional Folch method, which exploits toxic compounds such as methanol and chloroform. With some ASTROBIOTM green solvents, we extracted and purified 11.29 g of oils with an extraction efficiency of 79% ± 4.49% compared to the Folch method. The best results were obtained processing wet biomass, avoiding the desiccation step of the cells, which is promising in terms of energy and time savings for large scale applications and the development of a more sustainable process.

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Presentations

Evaluating and measuring the relationship between business and biodiversity: development of a model and operational tool within NBFC

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The loss of biodiversity and ecosystem collapse represent major threats to human well-being, increasingly drawing the attention of businesses due to regulatory pressure and sustainability concerns. However, understanding the complex interrelations between business, biodiversity, and ecosystems remains challenging. This research introduces a systemic model and an operational cognitive-assessment tool—referred to as BioModel—to support companies in identifying and managing these interactions.

BioModel classifies sixteen business impacts on biodiversity into five main categories: ecosystem use change, overexploitation, invasive species, pollution, and climate change. It also identifies twenty-four ecosystem services grouped into provisioning, maintenance and regulation, and cultural and immaterial services.

The BioModel application consists of four phases: (1) awareness-building around business-biodiversity dependencies and impacts; (2) a self-assessment questionnaire identifying key impacts and dependencies, compared with sectoral relevance scores from the ENCORE platform; (3) selection of appropriate indicators; and (4) data collection and visualization through a dedicated dashboard.

The underlying databases were constructed using major national and international biodiversity and sustainability classification systems. BioModel was pilot-tested with three agri-food companies—Alce Nero, Altromercato, and Almo Nature-Fondazione Capellino—providing valuable insights for refinement. A digital, user-friendly software version is currently under development to enhance usability and data management.

This research advances corporate biodiversity accounting by providing a practical framework and tool to support companies in addressing the multifaceted relationship between business activities and natural ecosystems.

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Presentations

SIRENS - Sistemi integrati per il restauro dell'ecosistema naturale sommerso

Emilio Mancuso[1,2]

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2. *Partner di progetto SIRENS*

The acronym has a ring of challenge, technology, and cross-disciplinary expertise dedicated to our seas: Integrated Systems for the Restoration of Natural Underwater Ecosystems. It is an industrial research and experimental development project in the field of eco-engineering, focusing on the ecological restoration of marine forests, with particular attention to sustainable and innovative solutions. The project is part of the National Biodiversity Future Center, funded by the European Union under the “Next Generation EU” initiative via Italy’s PNRR MUR funds. The project involves the design, production, and testing of technical solutions to overcome current limitations in the restoration of marine forests, especially for Cystoseira, addressing challenges such as the difficulty of operating on a large scale and the need for new materials and designs.
Three strategic intervention areas have been identified:
First, the Ligurian Sea for Cystoseira in the intertidal environment, with an initial survey phase at the pilot study site in the Municipality of Costarainera, where natural and/or artificial surfaces will be scanned to place the Natural Mimic Substrate™ (NMS™). Still in Liguria, a second “control” site will be located in the Municipality of Bogliasco.
The second intervention area is the Northern Adriatic Sea, where the project aims to produce and test new supports for the restoration of marine forests with Cystoseira in subtidal rocky environments, as well as to test substrates for Cymodocea nodosa in the Gulf of Trieste.
Lastly, but not least, in Lake Como the project plans the restoration of submerged seagrass meadows using 3D printing of composite substrates made from PLA and materials derived from littoral habitats. These substrates will be designed for rapid colonization by target species such as *Vallisneria spiralis* and *Myriophyllum spicatum*.

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Presentations

Protective role of verbascoside against misfolding and aggregation of α-synuclein associated with Parkinson's disease

Paola Coccetti[1], Alessia Lambiase[1], Farida Tripodi[1], Giorgia Spandri[1], Hind Moukham[1], Annalisa D'Urzo[1], Elisa Toini[1], Giovanni Zecca[1], Fabrizio Grassi[1], Mauro Commisso[2], Stefano Negri[2], Flavia Guzzo[2], Valentina Santoro[3], Anna Lisa Piccinelli[3], Sofia Salerno[4], Francesca Rinaldi[4], Enrica Calleri[4], Massimo Labra[1]

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α-Synuclein is a small presynaptic protein whose aggregation is one of the hallmarks of Parkinson's disease (PD). In our quest to identify novel preventive or therapeutic treatments for PD, we collected 60 Italian plant species which were screened by a phylogenetic analysis in conjunction with a high-throughput screening in a yeast model of PD. The integration of these approaches led to the identification of four plants, *Allium lusitanicum, Salvia pratensis, Verbascum thapsus* and *Glaucium flavum*, whose extracts, characterized by a metabolomic analysis, exhibit robust anti-aggregant properties in vitro, as well as in neuroblastoma cells overexpressing α-synuclein.
Results obtained by surface plasmon resonance assay highlight that the four selected extracts bind α-synuclein, supporting their inhibitory role on the aggregation of the protein. By employing a size exclusion chromatography affinity approach coupled to mass spectrometry, we identified verbascoside from the *V. thapsus* extract as the metabolite that directly binds α-synuclein and prevents the formation of its toxic oligomeric species. In addition, verbascoside is responsible for 50% of the anti-aggregating properties of the whole *V. thapsus* extract in neuroblastoma cells.
Our findings could pave the way for the development of new strategies aimed at preventing protein aggregation in neurodegenerative diseases.

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Presentations

Behavioural Observation in Beetles (BOB): Engaging Citizens in Insect Ethology

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The European stag beetle (*Lucanus cervus*) has always captured the interest of both scientists and the general public due to its charismatic appearance. It is the largest beetle species in Europe, easily recognizable by the enlarged mandibles of the males. Closely dependent on decaying wood, this species has disappeared from many European forests. As a result, it is now listed as "Near Threatened" on the European IUCN Red List and protected under the EU Habitats Directive.

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Presentations

Can Photovoltaic Farms Be a Nature-based Solution?

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The expansion of ground-mounted photovoltaic (PV) farms is reshaping rural landscapes, raising concerns about biodiversity loss and soil degradation. To address these challenges, we developed a harmonised framework integrating Nature-based Solutions (NbS) and Conservation Standards (CS) to guide the design and monitoring of PV farms. The framework identifies environmental pressures, defines mitigation strategies and indicators, and supports adaptive, site-specific monitoring. More than a tool for design and assessment planning, it serves as a nexus between science and policy, enabling evidence-based planning and supporting transformative change by repositioning PV farms as multifunctional NbS.

To demonstrate the need for such a tool, land use change from 2018 to 2024 is being analysed in Montalto di Castro (central Italy), a municipality selected for its rapid and ongoing PV expansion.

The framework is also being tested locally through pre- and post-construction monitoring under different vegetation management strategies.

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Key parameters related to soil, microclimate, vegetation and bioacoustics are being monitored to assess temporal changes and compare the ecological effects of spontaneous cover, forage cultivation, and traditional mowing. Soil monitoring includes assessments of physicochemical properties and microbial diversity.
Microclimatic monitoring covers air and soil temperature and humidity, and radiation. Vegetation is assessed through standardised field surveys. Bioacoustics monitoring uses acoustic indices and ultrasonic data to evaluate soundscape dynamics and bat activity.
This integrated approach aims to validate the framework's applicability while generating new knowledge on how PV design and land management influence ecosystem conditions.

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Presentations

Bricolage in Biodiversity Science: Enabling Innovation, Navigating Resistance

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2. *CNR*

This study explored the dynamics of innovation in biodiversity science from a bricolage perspective. Our results show how researchers overcome systemic constraints by actively recombining tools, networks, and knowledge to sustain innovation. The findings indicate that technological bricolage and collaborative bricolage act as important drivers for progress, enabling actors to creatively adapt existing resources and foster coordination across fragmented institutional frameworks. However, these efforts are often limited by what we have defined as inverted selective bricolage: a dynamic in which promising initiatives fail to mature or scale due to cultural resistance, institutional inertia, or misaligned incentive structures.

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Presentations

Aerobiome and environmental DNA: a novel tool for monitoring biodiversity in an Alpine region

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Airborne biodiversity reflects the presence of plant and fungal species across the ecosystem and records the seasonal variation in the phenological phase of flowering and sporulation. The ALPoll project explores the potential of airborne environmental DNA (eDNA) to monitor plant and fungal biodiversity in alpine areas, particularly rich in endemic species and sensitive to climate change.

In a preliminary study conducted at a rural site, airborne samples were collected using a Sigma-2 gravimetric sampler. DNA was extracted and amplified using ITS1 and ITS2 barcodes. Sequencing was performed via Illumina, and a tailored bioinformatics pipeline was developed for high-resolution taxonomic assignment.

A curated reference database was created by querying international sequence datasets with the list of species of the local flora and results were compared with the UNITE database of eukaryotic taxa. Aerobiological sample analysis by light microscopy was also applied to complement and interpret molecular data.

Results highlight seasonal dynamics in airborne pollen/plant biodiversity and confirm the effectiveness of eDNA for detecting diverse plant taxa. With UNITE and ITS1, samples included 19 genus of Viridiplantae and 250 genus of Fungi. ITS2 resulted in a deeper plant identification, with up to 45 families and 82 genera. Molecular and microscopic plant/pollen data resulted in a strong agreement, supporting the use of airborne eDNA as a scalable, non-invasive method for biodiversity monitoring.

This approach provides new insights into the aerobiome and supports the development of integrated monitoring tools, contributing to NBFC's mission of innovating biodiversity assessment and monitoring strategies across Italy.

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Presentations

SEASMA - Sea Smart Monitoring

Emanuele Giorgi[1]

1. *NEMEA srl*

The objective of the project is the continuous monitoring of the marine and coastal environment through an observation model based on three integrated data sources: Satellite data (optical and RADAR/SAR), direct collection of environmental parameters from IoT devices and missions with aquatic drones (USVs and ROVs), and integration of commercially available data. The collected data will be stored in a Data Lake, structured in accordance with broad-spectrum FAIR principles, and analyzed using AI algorithms to transform them into immediately usable information. The results will automatically highlight changes at sea and on land, enabling trend analyses and predictive analyses, as well as cause-effect modeling of local phenomena that determine or are determined by ongoing changes, and generating early warnings in case of critical situations.

Presentations

From plant biodiversity to the production of healthy ingredients for food nutraceuticals and packaging

Luca Rastrelli[1,2], Maria D'Elia1,[2,3], Giuseppe D'Auria[1,2], Rita Celano[1,2], Valentina Santoro[1,2], Anna Lisa Piccinelli[1,2], Mariateresa Russo[4], Sonia Carabetta[4], Rosa Di Sanzo[4], Luca Campone[5], Massimo Labra[5]

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The valorization of agricultural by-products, particularly artichoke waste, offers significant potential for sustainable practices in both food and material industries. Building on previous research optimizing green extraction methods, we have developed an innovative system for extracting bioactive compounds from artichoke by-products. The system utilizes ultrasound-assisted maceration in water to extract chlorogenic acid and cynarine, achieving concentrations of 5%, followed by tangential filtration to recover inulin. The macerate is then purified to enhance bioactive concentrations above 12%. The residual biomass is processed into compost or used to extract lignocellulosic material, which is converted into polylactic acid (PLA) for biodegradable films. This system can process up to 100 kg of artichoke biomass per day, contributing to waste reduction. In addition to these innovations, the bioactive compounds extracted from artichoke by-products are being explored for a wide range of applications. Our goal is to develop a versatile ingredient that can be utilized across various sectors, including food, nutraceuticals, cosmetics, and zootechnics. We are specifically investigating its potential in bakery products such as biscuits and pasta, as well as in liquors. At the same time, we are producing natural polymers from these by-products for sustainable, eco-friendly applications. This supports the development of green extracts enriched with antioxidants and prebiotics for functional foods and other markets. This work is part of the UFRAT project (Urban Food Recovery and Transformations), where Vitrosele, a leader in the artichoke industry, is a key partner. The project aims to create sustainable, economically viable systems for the recovery and industrial processing of local agricultural by-products, benefiting both the environment and the regional economy.

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Presentations

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Presentations

Reimagining education for biodiversity: an integrated approach from primary to secondary school

Fabio De Pascale[1,2], Chiara Anzolini[1,2], Sofia Belardinelli[1,2], Maria Berica Rasotto[1,2], Dietelmo Pievani[1,2]

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Biodiversity offers one of the most powerful solutions to the ongoing climate crisis. However, it is itself under severe threat – largely due to deeply rooted societal models and the way we perceive our relationship with nature. Embracing biodiversity's potential requires a profound cultural shift in how we conceive our place within the natural world. Future generations will be key agents in driving this transformation, and it is our responsibility to equip them with the knowledge and skills needed to foster this change.

Currently, biodiversity is not systematically addressed in the curricula of primary and secondary schools. Meanwhile, scientific research – accelerated by initiatives like the National Biodiversity Future Center (NBFC) – is evolving at a pace far beyond that of traditional education. Understanding biodiversity as a solution also requires interdisciplinary collaboration, integrating biology with economics, politics, urban planning, science communication, and technological innovation.

As part of Spoke 7 of NBFC, we are developing an integrated educational program spanning all school levels, from early primary to upper secondary. This initiative includes a wide range of engaging resources – practical activities, games, videos, and interdisciplinary modules – designed for use at school, at home, and in informal learning environments such as science centers. The program also supports educators with complementary materials to foster classroom discussion and critical reflection. These tools aim to enhance students' creativity, scientific literacy (particularly in STEM), and understanding of the societal and economic relevance of biodiversity and the central role it can play in sustainable development.

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Presentations

Integrated strategies for the restoration and protection of biodiversity in wetlands (Sebino Reserve)

Nicola Della Torre[1]

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The project has three main objectives. At the core is the implementation of innovative solutions, such as the installation of floating islands to recreate suitable habitats for rare bird species, and the restoration of dry hay meadows (6510) through seeding, mowing and fertilization, as well as the enhancement of an abandoned orchard. In parallel, multidisciplinary scientific monitoring is planned to deepen knowledge of wetland hydrology, fauna and vegetation, with a focus on priority species. The third axis includes involvement and training actions aimed at institutions, operators and citizens, with educational paths in schools, summer camps and popular meetings, also in collaboration with local tourism realities, to promote a shared culture of biodiversity.

Presentations

Spatial and habitat drivers of small-mammal diversity in urban green areas: lessons for urban green planning

Olivia Dondina[1,2], Emiliano Mori[2,3], Andrea Viviano[3], Valerio Orioli[1], Pietro Tirozzi[1], Luciano Bani[1,2], Leonardo Ancillotto[2,3]

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In a rapidly changing world, urban green areas play a vital role in biodiversity conservation. To protect these ecosystems, it is essential to identify effective bioindicators that can reveal which environmental characteristics best support rich and thriving natural communities. This study focused on small mammals as indicators due to their sensitivity to environmental changes.

Data were collected in three major Italian cities using 400 hair-tubes along a gradient of green area size-fragmentation. A multi-scale approach was adopted, analyzing synanthropic and non-synanthropic species separately. Linear regression mixed models assessed how spatial and habitat characteristics influenced species richness at the landscape scale. Results showed that synanthropic species thrived in manicured urban parks, while non-synanthropic species were more abundant in woodland areas with dense shrub cover.

To explore community composition, linear modeling and nestedness analyses were used, revealing that habitat characteristics played a stronger role than competitive exclusion or selective extinction/colonization. Generalized linear mixed models further investigated non-synanthropic species richness, showing that diverse communities succeeded in ecotonal areas with dense shrubs (brambles, hazel), tall grass, water sources, dead trees, and fallen branches. In contrast, species-poor communities were found in green spaces dominated by alien shrubs, large isolated trees, and low grass cover.

These results provide valuable insights for designing Nature-Based Solutions to support urban biodiversity. The publication of these findings in scientific journals on urban ecology and urban planning and in the NBFC report on biodiversity restoration highlights the potential of small mammals as concrete key indicators for planning greener, more biodiverse cities.

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Presentations

The sudden loss of macroalgal forest

Erika Fabbrizzi[1,2], Alberto Colletti[1,2], Sara De Benedictis[1,2], Luca Licciardi[1,2], Simone Maria Santo Musumeci[1], Chiara Silvestrini[1,2], Simonetta Fraschetti[1,2]

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Similar to terrestrial forests, habitat-forming seaweeds of the genus *Cystoseira* (sensu lato) create extensive underwater forests in the Mediterranean Sea, shaping habitats of rocky seascapes, hosting high biodiversity and enhancing coastal primary productivity. Nowadays, the cumulative impacts of climate change and human pressures are causing severe fragmentation and degradation of these marine forests, leading to regime shifts with detrimental effects on the associated species and communities. In Italy, local extinctions of *Cystoseira* s.l. have been documented since the early 2000s, yet the underlying drivers remain poorly understood. Reporting new disappearances and monitoring remnant populations are thus crucial steps to halt the ongoing declining trend. Recent expert observations documenting forests loss, combined with previous monitoring data and published literature, reveal that the deterioration of this critical habitat is advancing at an alarming rate. In particular, we show the example of the Apulia region where, over the past 5 years, continuous and dense belts of *Cystoseira* s.l. forests have completely disappeared from several stretches of coast, both on the Adriatic and Ionian sides. This sudden loss demands urgent and coordinated actions to protect and monitor these forests, fostering collaborations among scientific communities, policymakers, local stakeholders, and citizens. Macroalgal forests have been listed in the Annex II of the EU Nature Restoration Law, which mandates their restoration to good condition by 2030. Understanding the causes behind their decline is therefore critical to guiding efforts to reverse this trend and achieve this target.

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Presentations

Optimising analytical protocols for Rare Earth Element assessment in marine biota and sediments in hydrothermal marine systems

Ylenia Fabietti[1,2], Marcella Barbera[1], Francesco Paolo Mancuso[1,2], Gianluca Sarà[1,2], Daniela Piazzese[1]

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The distribution and bioavailability of Rare Earth Elements (REEs) across environmental compartments and biological components are key to understanding their geochemical behaviour and ecological significance. Here, we investigated REEs occurrence around Vulcano Island - the southernmost of the Aeolian archipelago (Italy) - which hosts hydrothermal systems as a natural laboratory, offering unique conditions to study the accumulation and distribution of REEs in different marine organisms under varying acidification conditions.

For this purpose, marine sediments and benthic organisms were collected in two areas characterised by different pH levels. Biotic samples included organisms at different trophic levels: Gobius incognitus, Anemonia viridis, and primary producers such as the seagrass Cymodocea nodosa and the alga Caulerpa prolifera.

A pseudo-total acid digestion protocol was optimised for the extraction of REEs in different matrices, targeting the labile fraction in sediments to evaluate potential REE mobility under natural conditions. In addition, the instrumental method for REE quantification was optimised using inductively coupled plasma mass spectrometry (ICP-MS). REE analyses in the collected samples are currently ongoing.

By examining REE pathways associated with natural hydrothermal activity, this study aims to assess whether the main factors influencing REE accumulation are linked to sediment distribution, environmental parameters, or the physiological traits of the investigated organisms. This approach may also offer insights into trace pollution pathways and the potential impact of anthropogenic REE contamination in marine environments, and the role of hydrothermal systems as both natural sources of REEs and analogues for exploring the effects of ocean acidification on marine biota.

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Presentations

Assessment of Ecosystem Services Provided by Urban Green Spaces Through the AIRTREE Model

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Forest ecosystems can reduce atmospheric contaminants through biological, chemical, and physical processes, thereby providing a range of Ecosystem Services (ES) that help mitigate climate change, purify air, and protect biodiversity. Green infrastructures such as urban parks, peri-urban forests, and street trees interact with and sequester carbon dioxide (CO_2), particulate matter (PM), and ozone (O_3), to which citizens are exposed. The ability of vegetation to absorb and interact with these pollutants is closely linked to leaf mass, surface area, and morphological traits, which are species-dependent. Recognizing this species specificity is essential to support informed urban green space management. Within the framework of the National Biodiversity Future Center, the AIRTREE model was developed and parameterized to estimate the ecosystem services provided by urban green areas. Results indicate significant variation in photosynthetic performance and pollutant sequestration depending on soil-climate conditions, tree species, and exposure to atmospheric pollutants. The model is accessible through a fully open-access web platform (www.air-tree.eu) designed to assist urban planning and the estimation of related ecosystem services. The site also hosts a decision support system (DSS) that helps identify tree species that maximize the ecosystem services required by urban planners and green space managers.

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Presentations

Oceanographic and ecological modelling tools for maritime spatial planning

Fianchini M[1,2], Zunino S[1,2], Baldan D[1,2], Bandelj V[1,2], Buccino G[1], Celic I[1], Cossarini G1, Gianni F[1], Laurent C[1], Libralato S[1], Panzeri D[1], Reale M[1], Rosati G[1], Salon S[1], Solidoro C[1,2], Canu D[1,2]

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As part of the MSP4BIODIVERSITY activity, OGS develops and provides a suite of data analysis and modelling systems that transform complex oceanographic and ecological data and knowledge into actionable insights to support Maritime Spatial Planning (MSP) in the Mediterranean Sea.
In MSP4BIODIVERSITY, three scenarios -Slow Pace, Nature at Work, and Blue Development were jointly developed to represent distinct, yet plausible, socio-economic pathways. These scenarios diUer in the intensity of human activities and the spatial use of the sea, oUering a structured way to assess potential impacts such as the designation of new marine protected areas, fishing restrictions, and oUshore infrastructure development, all in the context of climate change.
Our contributions intersect MSP at multiple levels, from broad assessments to detailed planning.
High-resolution, bias-corrected biogeochemical modelling outputs form the basis for medium-term planning (up to 2050) under climate change at all stages of the assessment.
Lagrangian simulations deliver high-resolution outputs on the transport and fate of pollutants, such as oil spills and emerging pollutants, informing risk mitigation and emergency response strategies.
In the ecological domain, species distribution models and spatial analyses of key native and invasive seagrasses, along with important demersal species, generate informative layers to guide zoning, conservation, and monitoring eUorts. Ecosystem modelling using Ecopath with Ecosim and Ecospace, provides system-level perspectives on how marine ecosystems might respond to changes in conservation, regulation and use.
Together, the suite strengthens the MSP process by linking environmental drivers, human activities and ecological processes across spatial and temporal scales.

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Presentations

Oceanographic and ecological modelling tools for maritime spatial planning

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On the ecological side, we develop species distribution models (SDMs) for both native and invasive species—such as Posidonia oceanica and Caulerpa cylindracea—to evaluate present and future habitat suitability. Spatial analyses identify hotspots for key demersal species, contributing baseline data for conservation zoning and fisheries management. Furthermore, we apply the Ecopath with Ecosim and Ecospace modelling suite to simulate ecosystem-level responses to alternative spatial and regulatory scenarios, including the implementation of marine protected areas and changes in fishing effort.
Together, these modules form a coherent modelling framework that integrates biophysical, ecological, and socio-ecological data, supporting robust and forward-looking maritime spatial planning.

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Presentations

Scientific citizenship, urban green spaces, and public wellbeing through a one health perspective at Villa Ada Park and zoology Civic Museum of Rome

Antonella Ficorilli[1], Tommaso Nastasi[2], Cristiana Lalli[2], Mattia La Torre[1], Fabrizio Rufo[1], Isabella Saggio[1]

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The speech will illustrate the activities and preliminary results of the citizen science pilot project "Una Salute nella Mia Città" (One Health in My City), promoted by the National Biodiversity Future Center – Spoke 7 Sapienza. The project explores the relationship between urban green spaces, mental and physical wellbeing, and urban design through the lens of the One Health paradigm.

The project, carried out in collaboration with the Adams Scienza Association and under the patronage of the Municipality II of Rome, adopts a citizen science approach to actively engage citizens, researchers, and institutional actors in a process of knowledge co-production. Two key spaces in Rome serve as the project's focal points: Villa Ada, one of the city's largest urban parks with rich biodiversity, where guided explorations and sociological surveys are used to investigate perceptions of the link between nature and wellbeing; and the Civic Museum of Zoology, a reference point for biodiversity education and civic engagement, which serves as a hub for analysing the collected data and co-design activities.

By fostering a collaborative and inclusive process, the project contributes to raise awareness, support informed decision-making, and promote a more ecologically and socially sustainable vision of green urban space.

The outcomes include a final report detailing the methodology and results, along with one or more position papers synthesizing proposals and reflections that emerged from the participatory process. These deliverables constitute the legacy of the project and represent a potential model for citizen involvement in urban environmental governance.

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Presentations

New frontier Multi-Omics approaches in fin whale (*Balaenoptera physalus*)

Maria Cristina Fossi[1,7], Giacomo Limonta[1,7], Matteo Baini[1,7], Jorge Urban[2], Jonathan W. Martin[3,4], Stefano Papazian[3,4], Daniel Zalko[5], Massimiliano Rosso[6], Cristina Panti[1,7]

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Cetaceans encounter in global oceans numerous anthropogenic chemical stressors, yet the cumulative exposure and effects of legacy and emerging contaminants in these species have never been assessed in their complexity. To evaluate the susceptibility of the endangered fin whale (*Balaenoptera physalus*) to chemical pollution, this study employed a multi-diagnostic molecular approach that integrates chemical exposomics, metabolomic and gene expression analysis in live-sampled free-ranging populations of the Mediterranean Sea (Pelagos Sanctuary) and Sea of Cortez (Mexico). Skin and blubber biopsies of fin whales were collected from the two areas: Med Sea (n=17) Sea of Cortez (n=11). Exposome profile was investigated in the blubber (by GC-HRMS) and 123 were annotated. 41 substances were quantified, including PCBs, OC pesticides, PCDFs and PBDEs. 386 compounds detected in skin by LC-HRMS were annotated. Several of these are emerging contaminants, ranging from pharmaceuticals, plasticizers, PFAS, and UV-filters. Mediterranean fin whales often exhibited higher concentrations of legacy and emerging pollutants, including polychlorinated biphenyls, plasticizers, PFAS and nicotine. In parallel, we carried out 1H-NMR and MS metabolomics studies on biopsies and this is the first time in which this technique is used in cetaceans to discriminate between populations by a multivariate model. Finally, a correlation between transcriptomic and exposome data supported by 32 network correlations with gene expression relevant to transcriptional regulation and endocrine disruption. In conclusion, we show a successful first application of new frontier multi-omics approaches in cetaceans inhabiting the highly anthropized ecosystem of the Mediterranean sea in comparison to the Sea of Cortez.

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Presentations

Communicating biodiversity: beyond the instructional paradigm

Andrea Galimberti[1]

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The contribution will summarise some assumptions on the importance of “communicating biodiversity” that lead the actions of the BEAT (Biodiversity Education and Awareness Toolkit) research group within the NBFC. In particular, it will focus on the relationship between ideas on communication and the design of educational settings. Considering biodiversity as a fundamental solution for the eco-climate crisis – a statement widely shared in the NBFC project – involves, for example, the risk of promoting exclusively instructional settings aimed at “conveying” this information to the general public. This kind of proposal, even if useful to create a counter-narrative against the dominant monological and monocultural thinking, is also problematic on different levels from an educational point of view. On one side, the current literature on education to biodiversity clearly states the need to avoid pre-formed formats and contents in favour of more exploratory and participatory ones based on sensorial experiences able to foster individual connections and discoveries (e.g. through place-based and biographical activities). On another level, the idea of considering the communication itself as an “anthropocentric instrument” can be problematized and made more complex through perspectives where the (bio)semiotic activity is thematized as a common feature of the “whole creature”: a fruitful and creative field for the educational imagination.

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Presentations

Contribution of remote sensing to the assessment of regional biodiversity in Italian lakes

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Biodiversity serves as a key indicator of the health of freshwater ecosystems, making its assessment crucial for managing human activities and conserving these vital resources. Satellite observations play an essential role in biodiversity studies by providing repeated, large-scale coverage of ecosystems. When integrated with in-situ biodiversity data and ecological modelling, remote sensing offers valuable insights into the state of biodiversity. This study highlights the contribution of satellite remote sensing to the National Biodiversity Future Centre (NBFC), which aims to monitor regional biodiversity in Italy's inland waters. For a eutrophic lake, Sentinel-2 data in recent years reveal an increase in phytoplankton biomass and the surface accumulation of cyanobacteria, leading to harmful algal blooms in autumn—likely driven by increasingly hot summers. To further investigate the effects of global warming, we analyse major Italian lakes using the time series satellite products. In particular, trends in water colour, surface temperature, and water levels are examined to assess their potential impacts on lake biodiversity, such as eutrophication processes and changes in thermal regimes. Additionally, hyperspectral remote sensing is explored for its ability to map phytoplankton community composition and functional attributes of aquatic vegetation, demonstrating its potential to observe Essential Biodiversity Variables at regional scale in freshwater ecosystems.

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Presentations

Marine Protected Areas as a tool for biodiversity protection: a comparative perspective between Italy and France

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Marine ecosystems are under increasing pressure from human activities, climate change, and biodiversity loss. In response, Marine Protected Areas have been widely adopted as a key tool for marine conservation, offering a framework to protect biodiversity, restore habitats, and support sustainable use of ocean resources.

This project critically assesses the effectiveness of Marine Protected Areas within the European Union, with a comparative analysis of Italy and France – two Member States with extensive coastlines and significant marine biodiversity. Despite the existence of a well-developed legal framework, including the Marine Strategy Framework Directive (2008/56/EC) and the Maritime Spatial Planning Directive (2014/89/EU), implementation remains uneven. The paper explores how these instruments often fall short due to conflicting economic interests, weak enforcement, and fragmented governance structures.

By examining the different governance models of Italy and France, the paper reveals that while both countries have made formal commitments to marine protection, practical outcomes are limited. In Italy, challenges include overlapping institutional competences and lack of funding, whereas France, despite a more centralized model, faces issues related to stakeholder inclusion and balancing conservation with industrial interests. The comparative perspective highlights shared challenges and opportunities for reform. The paper argues for a more integrated, ecosystem-based approach to MPA governance, emphasizing the need for clearer legal mandates, stronger enforcement mechanisms, and greater community involvement.

Ultimately, the study concludes that without substantial governance reform and political will, MPAs will struggle to deliver their full potential as tools for biodiversity protection in Europe’s increasingly stressed marine environments.

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Presentations

High-density urban environments reduce infection prevalence and genetic diversity of vector-borne parasites in synanthropic Italian sparrows (*Passer italiae*)

Luca Ilahiane[1], Mattia Brambilla[1], Joan Ferrer Obiol[1], Samuele Ramellini[1], Susan E. McKinlay[1], Irene Vertua[1], Corrado Alessandrini[1], Enrico Caprio[2,3], Fabio Marcolin[3], Riccardo Alba[2,3], Alessandro Sacchetti[4], Linda Colligiani[4], Iacopo Corsi[4], Gabriele Raiser[4], Mauro Del Sere[4], Alessandro Montemaggiori[5], Fulvio Fraticelli[5], Giuseppe Landucci[5], Emiliano De Santis[5], Rosario Balestrieri[6,7], Daniela Campobello[8], Mario Lo Valvo[8], Marie Claire Gatt[9], Benjamin Metzger[9], Elisa Fesce[10], Nicola Ferrari[10], Roberto Ambrosini[1,2], Dan E. Chamberlain[2,3], Gentile F. Ficetola[1,2], Andrea Galimberti[2,11], Luca Gianfranceschi[2,12], Carlo Polidori[1,2], Diego Rubolini[1,2], Martina Ferraguti[13,14]

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Birds in urban environments may benefit from high resource availability, scarcity of predators, increased nesting opportunities, and warmer microclimates during harsh weather. Conversely, drawbacks of urban life, such as low-quality diets, pollution, and exposure to heat islands may lead to high physiological stress. It has been suggested that infectious diseases are more frequent among urban-dwellers, potentially linked to simplified ecological networks, nutritional deficiencies and increasing stress levels. Nevertheless, evidence is inconsistent across urban areas and pathogens.

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We investigated infection prevalence of vector-borne avian malaria (haemosporidian parasites) in relation to urbanization. We did so by molecular screening nearly 400 Italian sparrows (*Passer italiae*), a highly synanthropic species, from seven large cities, scattered between Northern Italy and Malta, and nearby rural areas. Results revealed that infection prevalence was consistently and significantly lower in urban than rural areas (21.6% vs. 67.5%), as was the case for parasite diversity (7 vs. 12 lineages). Across all 37 sampling sites, we found a strong negative effect of human population density on infection probability.

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Given that haemosporidian vectors (blood-sucking Diptera) feed on both humans and sparrows, low prevalence in dense urban areas may be driven by a dilution effect mediated by high availability of non-competent human hosts (infection dead-end). However, local variation in competent host densities and altered vector communities along urban-rural gradients may also play a role. Whatever the main driver, urban-dwelling sparrows may benefit from considerably reduced parasitemia compared to their rural-dwelling counterparts, which may contribute to explain their successful spread in urban environments worldwide.

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Presentations

Environmental metrics for greening finance and for green financing

Alessandra La Notte[1]

1. *Senior consultant on Natural Capital Accounting*

Nature underpins human well-being and the global economy, and its degradation affects production processes and all the value chains that depend on them. Although this link between nature, the economy and finance is recognized, it is not yet clear how it works. Among the major initiatives taking place around the world, the UN System for Integrated Environmental and Economic Accounting (SEEA) provides the perfect framework for linking a rich set of environmental information with economic accounts in a consistent and coherent way. Natural capital accounts (NCA) that are consistent with the SEEA EA can address economic and financial challenges not only at the macroeconomic level but also from a business perspective. Some examples can illustrate how NCA in general, and ecosystem services accounts in particular, can support (i) greening finance, to inform and improve the management of economic exposure to nature-related risks, and (ii) green financing, to raise funds to address environmental issues.

Presentations

Nighttime artificial illumination changes the physiological responses of four tree species: a potential new stress factor for urban trees?

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Since the mid-20th century, artificial light at night (ALAN) has been known to affect trees, with the first evidence being the delayed leaf senescence observed in trees growing near streetlights. Despite many observations, research on this topic is still in its early stages, and many aspects of the phenomenon remain unclear. Therefore, the present experiment aimed to analyse the possible plant physiological alteration imposed by ALAN in four urban tree species: *Quercus ilex* (QI), *Quercus cerris* (QC), *Liquidambar styraciflua* (LS) and *Ginkgo biloba* (GB). The species were selected to represent ecological and functional diversity, considering their different botanical families and their potential distinct capacities to respond to ALAN. During the summer and autumn, physiological analyses were conducted on leaves in night-illuminated and non-illuminated (control) trees, with measurements recorded at dawn, midday, and nighttime. During summer, night-illuminated QI, QC, and LS trees exhibited reduced leaf net CO2 assimilation (Pn) at dawn compared to controls, also showing a concomitant reduction in stomatal conductance, which persisted at midday. In contrast, GB trees displayed no significant differences between treatments at either dawn or midday. At night, illuminated trees displayed positive net CO2 assimilation values, whereas control trees showed negative (consistent with nighttime respiration). During autumn, the exposure to ALAN notably delayed leaf senescence in all deciduous species except GB, displaying higher Pn values than controls. These species-specific responses underscore the need for targeted strategies to mitigate the potential adverse effects of ALAN on urban trees, thereby contributing to the resilience of urban ecosystems.

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Presentations

Planning for nature: toward operational guidelines for urban biodiversity in Italy

Pastore, M.C.[1], Lapenna, A.[1], Lazzarini, L.[1], Mahmoud, I.[1], Sandulli, M.[1], Zanotto, F.[1]

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Although biodiversity goals have long been integrated into urban planning practices across many European countries, Italy has experienced a significant delay in this regard. This lag can be attributed both to the limitations of current planning instruments and policies in adapting public action to incorporate new objectives and targets, and to a broader cultural delay in recognizing biodiversity as a priority for sustaining the socio-ecological and climate transition. As part of Activity 3 of Spoke 5 of NBFC, a survey of urban biodiversity policies, plans, and projects was conducted, focusing on the 117 provincial capital cities across Italy. This initial phase (Task 3.1) was followed by an in-depth investigation in eight cities (Turin, Trento, Bologna, Livorno, Campobasso, Avellino, Bari, Cagliari), carried out through field visits and semi-structured interviews with local institutional representatives, civil society stakeholders and professionals. The investigation aimed at exploring the challenges and limitations associated with biodiversity-sensitive urban planning, with particular attention to one key tool: the Urban Greening Plan (currently referred to as Urban Nature Plan by the EU Commission), which has been identified as a priority at both the European (EU Biodiversity Strategy 2030) and national levels (Linee Guida per la Gestione del Verde Urbano, 2017; DM 10/3/2020). Following this activity—which involved more than 80 interviews—a series of focus groups is currently underway, engaging various stakeholder categories in the consultation of operational Guidelines (Task 3.3) to support the elaboration and implementation of Urban Greening Plans as one of the main outcomes of the research.

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Presentations

Landscape anthropization and plant phenotype: a trait-based approach to urban biodiversity

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**Both authors contribute equally to the work*

As urbanization accelerates, understanding how plants phenotypically respond to anthropogenic pressures is critical for biodiversity conservation and the design of resilient Nature-Based Solutions (NBS). This study provides novel insights into the adaptive responses of synanthropic species (i.e., *Trifolium pratense* L., *Lotus corniculatus* L., and *Raphanus raphanistrum* L.) through an integrated analysis of fitness-related and interaction-mediating traits. We evaluated urban impacts on reproductive success (seed set and germination performance), floral reward quality (nectar sugar and amino acid profiles), and the modulation of secondary metabolites involved in plant-biotic interactions under varying land-use scenarios. Our results reveal significant phenotypic plasticity of the studied plant species and suggest the emergence of urban-adapted genotypes with potential value for ecological restoration and urban greening. Additionally, we surveyed reproductive and dispersal strategies of wild plant species across five Italian cities, identifying functional traits, such as entomophilous pollination and zoochorous dispersal, that can enhance urban ecosystem resilience. This analysis was complemented by an in-depth characterization of pollen nutritional quality, floral morphology, phenology, and nectar production, resulting in a comprehensive dataset to boost pollinator attraction in NBS planning. By integrating trait-based ecology with applied urban biodiversity strategies, our work highlights how phenotypic data can guide the development of more adaptive, biodiverse, and functional urban green infrastructures. These findings provide a framework for anticipating biodiversity responses to land-use change and for harnessing plant functional diversity in the face of global urban expansion.

Presentations

Transcriptomic response to urbanization in two wild bee species

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Habitat loss and fragmentation associated with urbanization significantly impact the biological and functional diversity of wildlife globally. Notably, wild bees are experiencing a decline in their diversity, abundance and trophic interactions due to the increase of impervious surfaces. Some of these important pollinators still find suitable habitats in urbanized areas, but the adaptive mechanisms allowing them to survive in such environments and the effects of urbanization on their biological functions remain largely unexplored. In this study, we investigated the transcriptomic responses to urbanization of two bee species, Bombus pascuorum and Osmia cornuta, by comparing populations living in urban and semi-natural sites in the metropolitan city of Milan. Specimens were collected from areas with varying degrees of urbanization, ranging from highly urbanized to semi-natural, and mRNA was sequenced to obtain detailed transcriptomic profiles for each individual. The results revealed differences between urban and semi-natural populations for both species. While most genes were co-expressed in both environments, distinct sets of transcripts were exclusive to either urban or semi-natural treatments. Differential gene expression analyses revealed a substantial number of genes up- or down-regulated in urban specimens, with more pronounced changes observed in O. cornuta. Enrichment analysis of differentially expressed genes revealed multiple biological functions and pathways affected by urbanization, also showing species-specific differences. These results lay the ground for further, currently ongoing, analyses, including a broader sampling effort and the integration of other 'omics' technologies, such as genomics and metabolomics, to comprehensively characterize how wild populations respond and adapt to urban-related stressors.

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Presentations

Ecological predictions for assisting decision making: the importance of long-term projections

Marta Magnani[1]

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Climate and land use changes are major factors contributing to the biodiversity and ecosystem functioning crisis. These in turn affect the yield of essential benefits provided by ecosystems to support human livelihoods, such as food supply, nutrient, carbon, and water cycling, thus posing unprecedented challenges to human societies. Management plans supported by scientific evidence can be used to limit the effects of the ongoing global changes on socio-ecological systems. Within the 'wildfire and biodiversity' thematic table of the NBFC, we discussed how to produce useful decision-making tools to support management plans. A framework addressing the implementation of management-oriented models emerged from the transdisciplinary experience of this group. While the urgency to implement management actions has focused scientific efforts on near-term ecological forecasting, we argue that long-term projections can be as important as short-term forecasts. We highlight the reasons for considering long-term ecosystem responses in management-oriented studies - particularly referring to wildfire management in Mediterranean ecosystems - and possible limitations of state-of-the-art modelling framework and datasets. The challenges of producing both short- and long-term predictions are presented. We emphasize the necessity of national and international networks for the convergence of experiences from different disciplines to produce timely and reliable ecological predictions. These networks should involve not only scientific teams but also stakeholders, such as landscape managers, local and regional agencies, national park rangers, sharing knowledge, competences, and aiming at mutual learning.

Presentations

RENOVATE: a nature-based solution for the restoration of marine ecosystems in the Civitavecchia port area

Marco Marcelli[1], Viviana Piermattei[2], Simone Bonamano[1], Bosch-Belmar Mar[9], Salvatore Causio[2], Giulia Ceccherelli[3], Giovanni Coppini[2], Giuseppe Andrea De Lucia[4], Paola Del Negro[5], Annalisa Falace[6], Ivan Federico[2], Alice Madonia[2], Paolo Francesco Mancuso[9], Lorenzo Mentaschi[8], Daniele Piazzolla[2], Nadia Pinardi[8], Gianluca Sarà[9], Alessandra Savini[10], Sergio Scanu[2], and Giorgio Fersini[7]

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RENOVATE is an Italian applied research initiative focused on the ecological restoration and functional recovery of marine ecosystems affected by the expansion of the Civitavecchia Port Hub. The project targets key sensitive habitats, including Posidonia oceanica seagrass meadows (Habitat 1120) and key biocoenoses within Habitat 1170 (Reef, including Mediterranean coralligenous assemblages), and two species of significant ecological and conservation value: Corallium rubrum and Pinna nobilis.

As an ambitious application of Nature-Based Solutions (NBS), RENOVATE adopts a holistic, science-driven approach to restore biodiversity and ecosystem services lost due to port development. The project is structured over a 10-year timeline, integrating experimental phases, adaptive management, and continuous environmental monitoring to optimize restoration strategies. A key innovation is its advanced observational and modeling system, which operates at regional and coastal scales to guide restoration efforts.

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Key activities include: strategic planning of habitat restoration interventions, development of an early warning system for extreme events and anthropogenic disturbances (e.g., dredging), design and implementation of ecological compensation measures, deployment of NBS for habitat rehabilitation, long-term monitoring of ecosystem service recovery. By combining cutting-edge science, adaptive management, and stakeholder engagement, RENOVATE aims to establish a replicable model for marine restoration in port-impacted coastal zones, contributing to sustainable blue growth and marine conservation.

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Presentations

The state-of-the-art, comparisons and mismatches amongst IUCN Red Lists and legislations for Italian biodiversity

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Italy is the first country in Europe for its biodiversity and endemisms, a heritage accompanied by complications when species protection and legislation needs to keep pace with taxonomic advances. Regional and global Red Lists produced by the International Union for Conservation of Nature (IUCN) are the foremost tool to prioritize protection of Italian species, despite the taxonomic biases in these lists and the proportion of Italian biodiversity assessed so far is unknown. Likewise, the account of Italian threatened and endemic taxa that has been included in European and international legislations has not been analysed systematically.

We present a first comprehensive, taxonomically-accurate review of threat status and policy inclusion of Italian biodiversity across three kingdoms (Animalia, Plantae and Fungi) where Italian checklists were cross-referenced with Italian, European and global IUCN Red Lists and policy annex lists (i.e. Bird and Habitat Directive, Bern and Barcelona Convention). To reduce taxonomic chauvinism when defining biodiversity, counts of introduced taxa were also included. The review yielded 75,697 native taxonomic units including 8,166 endemics, 2,068 introduced taxa, with 431 of these invasive. Only 5,491 taxa have been assessed by Italian Red Lists, with 1,479 of these endemic. Overall, only 966 taxa were considered in at least one legislation, although only a quarter of these were classified as threatened. With 714 taxa in worse conditions compared to European lists and 487 compared to global ones, we recommend that further assessments and policy updates should be made to enhance protection of Italian biodiversity.

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Presentations

EU law between sustainable forest management and protection of biodiversity

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In the Latvijas judgment 2023, the Court of Justice held that activities for the prevention of forest fire risks, consisting in authorised felling of trees, must, when carried out in a forest included in a Natura 2000 area, be subject to an assessment of their impact on the site. The felling of trees must be assessed as a precautionary measure in the light of the protection of the biotope (in this case 'Ancient or natural boreal forests'), for which the protection of biodiversity is also required through compliance with the parameter concerning the presence of dead wood necessary for the development of protected insect species in the area.The abstract focuses on what legal ways are chosen by the EU to achieve a protection of forest ecosystems that is at the same time a guarantee for the realisation of biodiversity protection needs. This is an issue that is also at the core of the 2024 Nature Restoration Regulation, and the particular implementation obligation that this regulation imposes on member states through the adoption of national restoration plans. In particular, in these plans, it will be up to the states to include specific measures to improve forest biodiversity through sustainable management, with an increasing trend of implementation, until 31 December 2030, of at least six out of seven of the indicators, specified in the regulation, for improving biodiversity (including the presence of deadwood, the share of uneven-aged forests or forests dominated by native tree species, and the common forest bird index).

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Presentations

Invasive alien plants respond differently to physical properties of urban areas: an analysis in three of the largest cities in Italy

Chiara Montagnani[1], Nicole Sebesta[2], Emanuele Vegini[1], Giulia Daniele[3], Elena Barni[2], Laura Celesti-Grapow[4], Francesca Emili[4], Federica Larcher[3], Rodolfo Gentili[1], Maria Laura Carranza[5], Angela Stanisci[5], Lucia Antonietta Santoianni[5], Marco Varricchione[5], Sandra Citterio[1]

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Invasive alien plants are widespread in cities, posing a threat to urban ecosystems, citizen health and urban heritage. Cities offer a wide array of novel suitable habitats. Consequently, understanding how physical properties of cities, such as level of urbanization and urban elements, contribute to their persistence is essential. In response to these two factors, in three major Italian cities – Rome, Milan, Turin – this study focused on the distribution and abundance of a group of highly invasive alien plants. The occurrence of 26 target species was investigated in response to cover and fragmentation of artificial surfaces and type of urban element (e.g. infrastructures, gardens, buildings). With nearly 20,000 occurrences recorded, our study found that the most widespread invasive species were Ailanthus altissima, Parthenocissus aggr., Phytolacca americana, Robinia pseudoacacia, and Sorghum halepense, with Ulmus pumila surprisingly common in Milan and Turin. The results revealed that species adapted to city centers, such as A. altissima, contrasted with those more common in suburbs, such as R. pseudoacacia. Physical constraints likely limited species' presence on buildings and service areas (e.g., industries, cemeteries), while gardens and roads supported higher species richness and frequency. This comparative study provides valuable insights into the spread of invasive alien plants in cities and the varying degrees of urbanization and type of urban elements in highly urbanized areas in Southern Europe. This analysis will form the basis of planning tools that will be useful in guiding strategies to mitigate or prevent the spread of invasive alien plants in cities.

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Presentations

Rising records of alien planarians in urban areas of Italy: a decade of citizen science monitoring

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The introduction and establishment of alien planarians in non-native environments represent a growing threat to soil biodiversity, with potential cascading effects on native invertebrate communities. In recent years, increasing reports of invasive terrestrial flatworms have emerged across Europe, but their presence in urban areas remains poorly documented. Over the past decade, a large-scale citizen-science monitoring initiative has tracked the spread of alien planarians throughout Italy, revealing a significant increase in their recorded occurrences. Our study has confirmed the presence of at least 15 species of invasive flatworm species in over 60 Italian cities, highlighting their ability to thrive in anthropogenic environments.

We developed a growing database, currently including over 300 verified records. Each record includes photographic evidence and precise species identification, confirmed through an integrative taxonomic approach combining morphological and genetic analyses. The accuracy of these identifications has been validated by international experts, ensuring the reliability of the dataset. Several alien species are expanding their range within Italy, likely facilitated by human-mediated transport, trade of plants and soil, and the increasingly interconnected urban landscape.

The continuous increase in alien planarian records raises concerns about their ecological impact, particularly their predatory pressure on native soil fauna, including earthworms, molluscs, and other invertebrates essential for soil health. Given the potential impact on soil biodiversity and ecosystem functioning, long-term monitoring and early detection efforts are critical to mitigate their effects.

Our study highlights the effectiveness of citizen science in detecting and documenting invasive species, particularly in regions where systematic surveys are lacking.

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Presentations

Unravelling pharmaceutical pollution in the Mediterranean: mapping presence and effects to prioritize risks for marine biodiversity

Alessandro Nardi[1,2], Marica Mezzelani[1], Daniele Fattorini[1], Marta Di Carlo[1], Michela Panni[1], Veronica Vivani[1], Lucia Pittura[1,2], Giuseppe d'Errico[1,2], Ilaria Bernardini[3,2], Massimo Milan[3,2], Maura Benedetti[1,2], Stefania Gorbi[1,2], Francesco Regoli[1,2]

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Contaminants of emerging concern (CECs) as active pharmaceuticals (APs) are increasingly detected in marine ecosystems due to widespread use and limited removal in wastewater treatment plants. Despite recognized biological reactivity in non-target species, cocktail effects and modulation under climate-change scenarios (e.g. heatwaves), CECs lack comprehensive risk assessment and are excluded from environmental regulations and monitoring, limiting capability to mitigate pollution-mediated biodiversity loss.

We present a multidisciplinary assessment of APs risks in the Mediterranean, within NBFC Spoke 2 – Activity 1.2, "Zero Pollution Strategy for Biodiversity Protection". The occurrence of 31 APs was mapped in marine organisms across six Mediterranean areas and integrated with transcriptional to whole-organism biological responses evaluated through laboratory-based experiments, identifying priority risks through an effect-based approach.

At least one AP was detected in all organisms, and 50% had up to seven co-occurring APs. Diclofenac (85%), verapamil (68%), fluoxetine (66%) and carbamazepine (58%) showed the highest occurrence rates. APs presence and levels varied across sites and species—e.g. metformin detected in 100% invertebrates (32% fish), whereas ibuprofen exclusively in fish (23%). Most compounds ranged from few to tens ng/g, but ibuprofen reached hundreds and gemfibrozil thousands ng/g. APs uptake, metabolism and sub-lethal effects at environmental concentrations were highlighted in laboratory-experiments on marine models, showing altered oxyradical, lipid, and cholinergic metabolism, often mirroring human therapeutic mode-of-action but also causing adverse outcomes as oxidative damages, energy reserves dysregulation and immunotoxicity.

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These findings will support Mediterranean biodiversity protection, identifying priority risks for regulation, developing effect-based monitoring tools, promoting awareness and sustainable choices.

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Presentations

Large-scale bioprospection of the Italian flora: from the discovery of useful phytochemicals to the study of metabolome diversification in land plants

Stefano Negri[1,2], Leonardo Bisson[1,2], Fabio Pietrolucci[1,2], Gianluca Zorzi[1,2], Valentina Dusi[1,2], Mauro Commisso[1,2], Linda Avesani[1,2], Flavia Guzzo[1,2]

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During their history, plants evolved various physiological and chemical adaptations to overcome the constraints of their sessile nature, thrive in diverse environments, and coexist with other organisms. The extensive diversity in structures, functions, and bioactivities of plant specialized metabolites offers an immense potential for bioprospecting, i.e. the exploration of biodiversity to generate new resources of social and commercial value. At the same time, it poses a significant challenge in understanding the biosynthesis and diversification of specialized metabolites among land plants.

As part of Spoke 6 – activity 2, we launched a large-scale bioprospection plan to explore the huge phytochemical diversity of the Italian flora (counting more than 11,000 vascular and non-vascular taxa). Based on a phylogenetic criteria, we set up a collection of about 700 plant species (7% of the Italian flora), ensuring representation of all plant families in accordance to their relative amplitudes (e.g., for Angiosperms, in order: Asteraceae, Poaceae, Fabaceae, etc.). As their specialized metabolomes are progressively characterized through UPLC-HR-MS, the species enter a top-down bioactivity screening program targeting non-communicable diseases (e.g., neurodegenerative diseases, cancer, metabolic syndrome, etc.) and crop enhancement and protection. The goal is to identify plant species and phytochemicals that can be exploited to produce pharmaceuticals, nutraceuticals or products for sustainable agriculture. In parallel, comparative data generated from the untargeted metabolomics analysis of the collection will show how plant specialized metabolites chart within the various lineages of the Italian flora (e.g., Asterids, Rosids, Monocots, etc.), providing new insights to understand metabolome diversification in land plants.

Presentations

Studying genetic variability at population level

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Allele Specific Expression (ASE) refers to the phenomenon in which one allele of a gene is expressed more than the other in a diploid individual, potentially leading to Allelic Expression Imbalance and influencing genetic variability and phenotypes. We developed a theoretical and experimental approach to study genetic variability at the population level starting from Rna-sequencing data. Our
method first determines the ASE for each gene in all heterozygous individuals and uses the information from all the combinations in which the same haplotype is found to compute the Estimated Genetic Contribution (ECG) of each allele.
Then, ECGs are integrated with population genetic concepts, such as those at the foundation of Hardy-Weinberg principle, to compute Population-Specific Gene Imbalance. Finally, measures from information theory are employed as metrics for analyzing genetic stability at population level.
An advantage of our method is that it can be applied to infer the contribution of each allele to the genetic variability. Moreover, we can now have an estimate of what would be the ASE of a gene for a hypothetical individual with two alleles never observed together in a population. This enables us to integrate it with traditional methods used in population genetics.
As a case study, we applied our approach to analyze transcript levels in leaves of 98 whole genome sequenced grapevine genotypes. We observed that the genetic variability of individual genes is mainly due to the presence of a multiallelic system with several levels of expression associated with the presence of multiple haplotypes.

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Presentations

Zoology museum of Rome: establishing a biodiversity research and Communication Center

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The speech will present the activities and the preliminary results of a partnership to revitalize the Zoology Museum. Through a formal Scientific Collaboration Agreement between the Museum System of Rome and La Sapienza University, the museum is evolving into a significant hub for biodiversity research and public engagement, benefiting from the expertise and resources of the National Biodiversity Future Center. This initiative aims to redefine the museum's role to become a center dedicated to understanding and communicating the importance of biodiversity and its conservation. The comprehensive project encompasses several key objectives:

• Set up a State-of-the-Art Infrastructure for Collections Management and Research, establishing advanced infrastructure for the digitization of the museum's valuable collections by the creation of specialized laboratories. These advancements provide researchers with the necessary access to cutting-edge technologies for conducting state-of-the-art studies on biodiversity. Consequently, the museum's collections gain essential scientific functions. The photographic and 3D digitization lab is now available with a dedicated workstation.

• Revitalizing Spaces for Science Communication and Citizen Science Initiatives: The project also prioritizes the transformation of the museum's spaces to foster greater public interaction with science. Specifically, a dedicated area within the museum is undergoing complete restyling to effectively communicate animal biodiversity. This revitalization focuses on the museum's exceptionally rich collections, including many specimens currently held in storage and inaccessible to the public. Photographic and 3D digitizations are being massively collected to further enhance the public engagement and accessibility to museum collections.

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Presentations

Understanding biodiversity through exploration: preliminary insights about methods and tools from research field

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The research summarises the work carried out by the BEAT (Biodiversity Education and Awareness Toolkit) research group for the NBFC in the fields of biodiversity education. It focuses on the methodological framework implemented, based on experiential and participatory approaches, aimed at promoting awareness of the biodiversity's value in connection with local environments and variety of its features. Exploring is here conceived as a pedagogical approach which, while supporting individual interests, encourages questioning and co-research within the group, among peers and with adults.

A sustainable toolkit was designed in order to facilitate the explorative approach in heterogeneous places (urban environments and natural ones). The toolkit consists in a set of easily handmade paper becks, combinable, containing different input useful to start exploring.

Since november 2024, following a national open call, this approach is implemented (still ongoing) through the aforementioned toolkit and currently involves over fifty professionals from different educational services (from ECEC to secondary schools), distributed in 10 Italian regions and has already reached more than 650 children and youngs, from 3 years old to University students.

Preliminary research results show that an exploratory approach based on a direct relation with places and real curiosity, when accompanied by adults who are able to give space to exploratory paths, stimulates knowledge production through self-questioning, self-positioning in relation to variability and construction of meaningful "patterns" useful for interpretation. This kind of experience, repeated over time, fosters a deeper learning attitude rooted in curiosity, autonomy, and connection with the surrounding environment.

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Presentations

PollinAId: a web tool to support the design of Nature-Based Solutions for pollinators safeguard

Emiliano Pioltelli[1,2], Paolo Biella[1], Andrea Galimberti[1,2], Lorenzo Guzzetti[1,2], Nicola Tommasi[1,2], Massimo Labra[1,2]

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Pollination is a vital ecosystem service with substantial ecological and economic value. The urgency to halt and reverse pollinator decline is reflected in emerging policy frameworks such as the Nature Restoration Law, which explicitly targets the recovery of pollinator diversity and abundance. Achieving this goal also depends on local-scale interventions, such as the implementation of Nature-based Solutions (NbS) specifically designed to support pollinators, such as flower gardens and strips tailored to their ecological needs. We present a decision-support tool developed to guide the design, maintenance, and enhancement of NBS to support pollinator populations, built on transversal knowledge, combining data from scientific literature and citizen science platforms. By integrating environmental parameters of a given area, along with aesthetic preferences and management requirements of the end-user, the tool suggests combinations of herbaceous species to attract, nourish, and host diverse insect pollinator communities. To maximize support for pollinators, the system considers key factors such as species-specific flowering times, assembling plant communities that ensure continuous blooming across the entire pollinator season. It also integrates plant-pollinator interaction data to forecast the composition of the pollinator community that may benefit from the NBS interventions. Aside from supporting intervention planning, the tool provides structured, accessible fact sheets that serve both educational and technical purposes, promoting dissemination among non-experts and offering an informative platform for researchers and professionals. Through the integration of ecological knowledge, practical constraints, and predictive modeling, this tool offers a scalable and science-driven approach to transform local interventions into effective biodiversity strategies.

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Presentations

Application of cumulative effect assessment and maritime use conflict MSP-oriented web-tools in the Sardinian case study

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The application of the CEA (Cumulative Effect Assessment) and MUC (Maritime Use Conflict) MSP-oriented web-tools, implemented within the Tools4MSP framework, was carried out within 9 ecological corridors (433 km2) identified as potential connections for the Habitat 1120 (Posidonia oceanica) between protected areas (MPAs and Natura 2000 sites) in Sardinia's coastal territorial waters. These corridors are crucial for expanding protected zones and promoting marine ecosystem conservation.
The analyses revealed the spatial distribution of anthropogenic pressures that significantly impact the sensitive habitats of *P. oceanica*. The MUC model identified high-risk areas, particularly in corridors 1 (Teulada, south), 4 (Sinis, central west), and 7 (Porto Torres, north), where overlapping and incompatible maritime activities increase the risk of environmental degradation and socio-economic conflicts.
The CEA model quantified cumulative impacts on *P. oceanica*, highlighting vulnerable zones in corridors 1, 2 (S. Antioco, south), 3 (Carloforte, south), 4, 7, and 8 (Olbia, northeast), where intensified human activities negatively affect marine ecosystems. Conversely, corridors 5 (Putzu Idu, central west) and 6 (Is Arenas, central west) showed lower impact levels, reflecting reduced anthropogenic pressure in both models.
These findings emphasize the need for integrated maritime spatial management to balance economic activities with environmental conservation. Key strategies include separating conflicting uses from ecologically sensitive areas, strengthening the protection of MPAs and Natura 2000 sites, and promoting sustainable tourism. Expanding protected areas and monitoring anthropogenic activities are vital for ensuring the long-term protection and conservation of marine habitats.

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Presentations

A Nature Based Solution for soil restoration: selection and isolation of promising polycyclic aromatic hydrocarbons (PAHs) - degrading fungal strains

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Soil hosts diverse microorganisms, including fungi, whose interactions underpin important ecosystem services. Anthropogenic activities (e.g. industrial processes, traffic pollution etc.) threaten soil health by accumulating xenobiotics like PAHs. Bioaugmentation of autochthonous fungal strains capable of degrading PAHs is a promising Nature Based Solution for soil remediation. This work led to the isolation and identification of fungal strains from enriched cultures performed on a contaminated soil.

Three consecutive enrichments were performed using four individual PAHs and a mixture of them as sole carbon source to foster the growth of specialized fungal communities. Following solid screening, isolates were purified and identified using a polyphasic approach. In parallel, metabarcoding analyses were performed to assess fungal community dynamics across enrichment steps.

Among 102 isolates (12 genera and 18 species) recovered, the most represented classes were Sordariomycetes, Eurotiomycetes, and Dothideomycetes, with Hypocreales, Cladosporiales, and Eurotiales as the dominant orders. Metabarcoding analyses yielded similar results. Biodiversity indices calculated for each sample revealed that both contaminant type and enrichment progression significantly reduced the number of OTUs, indicating a strong selection for specialised communities and, interestingly, the number of pathogenic species increased as result of the selective pressure. Additionally, strains of Cladosporium allicinum, Geotrichum. candidum, Paracremonium sp., and Penicillium chrysogenum were positive to biosurfactant production assays, suggesting a potential to enhance PAHs bioavailability.

This study demonstrates effective strategies for isolating PAH-degrading fungi and underscores their potential as bioremediation agents, supporting their use in restoring contaminated soils. The most promising strains are currently being selected though miniaturized screenings.

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Presentations

Urban butterfly diversity is shaped by an inverse luxury effect, imperviousness and green management in Italy

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Urban green spaces can support pollinator biodiversity, yet ecological and socioeconomic factors may influence their effectiveness. In this study, we investigated how local habitat variables and neighbourhood-level socioeconomic context affect butterfly communities in Turin, Italy. We sampled diurnal Lepidoptera in public parks and tree-lined streets over five sessions during the summer, using standardized 15 min point counts.

At each site, we recorded nectar plant richness, grass height, impervious surface cover, and the average real estate value per square meter in the district. Generalized linear mixed models (GLMMs) were used to assess effects of these variables on species richness, abundance, and Shannon diversity, with sampling sessions as a random effect.

Results showed that butterfly richness and abundance increased with grass height and nectar plant availability, highlighting the importance of less intensively managed, florally rich vegetation. In contrast, imperviousness and higher real estate values negatively affected all biodiversity metrics, suggesting an inverse luxury effect: wealthier areas, often with more manicured vegetation, may offer lower habitat quality for butterflies.

Butterfly diversity and abundance were also significantly higher in urban parks compared to tree-lined streets, likely due to greater habitat complexity and reduced disturbance.

Our findings underscore the value of ecologically informed urban green space management. Enhancing plant diversity and reducing mowing intensity can benefit urban butterfly communities. Moreover, addressing socioeconomic disparities in green space quality may help promote both ecological and social sustainability in cities.

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Presentations

Trees after fire: an investigation into the growth of Pinus nigra impacted by forest fires in central Apennines

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Climate change increases forest vulnerability, particularly in sensitive regions like the Mediterranean. Understanding climate-driven growth dynamics is crucial for habitat conservation and predicting species' adaptability to future conditions. Fire frequency is increasing, with pine forests experiencing a disproportionately high incidence of burning. After wildfires, salvage logging is common to remove burnt logs, but this practice can harm forest regeneration by removing fire-damaged trees that might still survive. These trees, especially in species like Pinus nigra, play a key role in post-fire recovery, providing habitat and supporting biodiversity. Understanding the factors that influence the long-term survival or decline of trees that were not directly killed by the fire is essential for guiding post-fire forest management. During the summer of 2017, Italy experienced a high number of wildfires. In the Morrone Mountain (Maiella National Park), an area of 1837 ha was burned and coniferous plantation represented one of the most damaged ecosystems. The study evaluated the effect of fire severity on Pinus nigra radial growth in the central Apennines. Therefore, the aim of the study is to assess the relative impact of the second order fire effects on plant functions and the ecological role of the surviving trees in the post-fire dynamic of the forest. Specifically, it focuses on evaluating pre- and post-fire tree growth in individuals with varying degrees of stem and crown burning. The results support post-fire recovery by emphasizing the role of surviving trees in biodiversity restoration and guiding forest management that balances ecology and economics.

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Climate change increases forest vulnerability, particularly in sensitive regions like the Mediterranean. Understanding climate-driven growth dynamics is crucial for habitat conservation and predicting species' adaptability to future conditions. Fire frequency is increasing, with pine forests experiencing a disproportionately high incidence of burning. After wildfires, salvage logging is common to remove burnt logs, but this practice can harm forest regeneration by removing fire-damaged trees that might still survive. These trees, especially in species like *Pinus nigra*, play a key role in post-fire recovery, providing habitat and supporting biodiversity. Understanding the factors that influence the long-term survival or decline of trees that were not directly killed by the fire is essential for guiding post-fire forest management. During the summer of 2017, Italy experienced a high number of wildfires. In the Morrone Mountain (Maiella National Park), an area of 1837 ha was burned and coniferous plantation represented one of the most damaged ecosystems. The study evaluated the effect of fire severity on *Pinus nigra* radial growth in the central Apennines. Therefore, the aim of the study is to assess the relative impact of the second order fire effects on plant functions and the ecological role of the surviving trees in the post-fire dynamic of the forest. Specifically, it focuses on evaluating pre- and post-fire tree growth in individuals with varying degrees of stem and crown burning. The results support post-fire recovery by emphasizing the role of surviving trees in biodiversity restoration and guiding forest management that balances ecology and economics.

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Presentations

Spatial planning for environmental justice: defining planning criteria for steering an inclusive future urban development

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Rapid urbanisation exacerbates socioeconomic inequalities and ecological degradation, causing an unbalanced spatial distribution of ecosystem services (ES). These essential benefits are frequently concentrated in wealthy urban areas, leaving marginalised communities underserved and vulnerable to increased environmental risks. This spatial injustice emphasises how urgently spatial planning needs to be rethought in light of a more equitable distribution of ES, where all communities' access to nature-based benefits is acknowledged as a prerequisite for human well-being and health. Integrating equity considerations into a city's environmental and ecological components is central to ensuring that benefits are accessible to all citizens. This study provides a combined framework for evaluating environmental equity in urban planning, taking into account spatially explicit data from multiple disciplines to illustrate the complex interrelationships among biodiversity distribution, ecological functions, and socioeconomic vulnerability.

The methodological approach was tested and validated in two pilot cities (Milan and Turin), identifying priority areas for planning intervention. This approach encourages a new paradigm for spatial planning, in which the design of spaces – as well as the criteria and parameters guiding the transformation of urbanised areas – must consider both the equitable distribution of environmental rights and the spatial distribution of biodiversity. Specifically, results allow the establishment of criteria and parameters (as performance standards) fostering the use of Nature-Based Solutions (NbS). These urban planning parameters can reshape the existing cityscape by enhancing ecological connectivity, increasing access to green and blue infrastructure, and steering future urban development towards more inclusive, resilient, and environmentally just environments.

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Presentations

Multi-analytical profiling of *Ziziphus Jujuba* fruit: a source of antioxidant and bioactive compounds in plant biodiversity

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In the context of growing interest in plant biodiversity, this study focuses on the molecular characterization of the fruit (pulp and seed) of *Ziziphus jujuba*, a species native to China and now naturalized in parts of Europe. Despite its long-standing use in traditional medicine, the fruit remains relatively unexplored from a molecular and phytochemical perspective.

A comprehensive, multi-analytical approach was employed to investigate the fruit chemical profile. Gas chromatography-mass spectrometry (GC-MS) was fundamental for the qualitative assessment of the volatile and volatilizable organic compounds present in both pulp and seed. To broaden the chemical profiling to include polar compounds, complementary techniques such as infrared spectroscopy, liquid chromatography with diode array detection (LC-DAD), and phosphorus-31 nuclear magnetic resonance (31P-NMR) spectroscopy were used. These analyses revealed the presence of bioactive molecules such as flavonoids, anthocyanins, and tannins. Further spectrophotometric assays assessed the total phenolic content, proanthocyanidins, and antioxidant capacity, while atomic spectroscopy (AAS and ICP-OES) was used to evaluate metal content and potential heavy metal contamination.

Moreover, the antioxidant properties identified in the fruit have also been exploited in the fermentation of kombucha, testing the properties of this new formulation with respect to the traditional one.

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Presentations

Early biological effects of air pollution in urban workers: preliminary findings from the IDEA Project

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Urban outdoor workers (OWs) are professionals who are exposed daily to air pollutants due to prolonged periods spent outdoors during work shifts. Within the IDEA project, a multidisciplinary study was conducted in Pavia to investigate the association between environmental exposure and early biological effects. At the current stage, a total of 67 workers have been enrolled: 21 OWs (i.e., police officers) and 46 indoor administrative workers (IAWs). All participants wore passive samplers (Radiello®) for five consecutive working days to assess personal exposure to benzene, NO_2, and SO_2, and underwent blood sampling for the analysis of routine biochemical parameters, inflammatory cytokines (CCL2, CXCL8, CXCL10), and thyroid function, including TSH, fT3, fT4, and autoantibodies. Preliminary results showed that mean NO_2 exposure was slightly higher in IAWs (23.9 μg/m³) than in OWs (20.1 μg/m³), while average benzene exposure in OWs was 3.5 μg/m³, exceeding the European target value for human health protection set for 2030 (i.e., 3.4 μg/m³). Although pollutant levels complied with current regulations and exceeded the 2030 limits by less than 10%, OWs exhibited significantly higher median values of erythrocytes, hemoglobin, hematocrit, vitamin B12, vitamin D, and fT3 compared to IAWs. While these values remain within normal reference ranges, the differences may suggest early biological effects potentially related to outdoor occupational exposure. Conversely, the data on inflammatory cytokines are currently insufficient to draw definitive conclusions. These findings underscore the need for targeted surveillance strategies and further investigation into the health impacts of the urban exposome.

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Presentations

Valuing natural capital through ecosystem services. The challenges and opportunities of the EU Nature Restoration Law

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The EU Nature Restoration Law formally recognises ecosystem services (ES) as a key element for nature restoration and ecological transition in Europe. Their quantification and evaluation allows the value of nature to be integrated into decision-making processes and to guide spatial planning in line with the objectives of the Nature Restoration Regulation (EU) No. 1991/2024.
ES assessment and valuation enable more effective identification of areas and needs for action to promote the protection of biodiversity, the evaluation of short- and long-term effects of environmental investments and the promotion of sustainable development strategies.
This contribution proposes a reflection on methodological approaches and operational tools for analysing ES, with particular reference to the fields of planning, environmental reporting and spatial policies.
Through a series of application examples, it is highlighted how ES can support the development of integrated strategies based on clear and transparent metrics. Moreover, the ES approach enables the strengthening of multilevel ecological governance by fostering integration and the development of synergies between sectors and stakeholder participation. Recognition of the value of ES can attract public and private investment, facilitate innovation in production systems, and support the creation of sustainable value chains.
ES measurement and valuation within the EU Nature Restoration Law can be used to lead a sensible planning of the territory and to foster a sustainable balance between biodiversity conservation and socio-economic development.

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Presentations

Interactions between fine roots of Quercus cerris L. and the microbial community: an integrated perspective across top- and subsoil layers in non-urban, peri-urban and urban rhizosphere

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The rhizosphere in urban environments plays a key role in plant health and environmental sustainability. Nevertheless, its spatial variability within urban forest ecosystems remains poorly understood, particularly for holobionts based on large organisms such as trees.

In this context, we aimed to explore the variations and the reciprocal influence that the fine root functional traits of *Quercus cerris* L. have on the microbial community by analyzing the topsoil and the subsoil rhizosphere across forests from non-urban, peri-urban and urban sites. Our results revealed that in non-urban forests, fine roots tend to be shallow and engage with diverse microbial phyla in the upper soil layer, impacting necromass and, consequently, carbon cycling. In peri-urban forests, fine root traits show depth-related variability, including higher specific root length in the top layer potentially leading to microhabitat fragmentation. In urban settings, instead, interactions affect root length and biomass without significant changes and mostly occur deeper in the soil, which may signal environmental stress. Additionally, based on our findings, we recognize the underrepresented microbial phyla as pivotal in shaping this complex interplay. Although not all fine root-microbe interactions can be fully disentangled, these findings highlight the need for further research to better understand the spatial dynamics of root-microbiome relationships in the rhizosphere, which may serve as potential ‘rhizosphere fingerprints’—valuable indicators of rhizosphere status.

Presentations

The Italian biodiversity of hoverflies (Diptera, Syrphidae): A key taxon for pollination and biological control

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In recent years, there has been a growing interest in Syrphidae (Diptera) due to their fundamental role in fundamental ecosystem services such as pollination and biological control. With more than 530 species recorded, the Italian Syrphidae fauna is the second richest in Europe. However, knowledge about hoverfly biodiversity in Italy remains fragmented and incomplete. Thanks to funding support of the NBFC, several initiatives have been undertaken to enhance the understanding of hoverflies in Italy. Specifically, the following activities were carried out:

1. Updating the checklist of Italian Syrphidae, with a focus on regional distribution. The revised data revealed some knowledge gaps, particularly in southern Italy.
2. Revision of historical data, supported by the study of museum collections, to validate and complement existing records.
3. The launch of the “Syrphidae of Italy” project on Taxonworks, aimed at creating a comprehensive, user-friendly database containing all available information on Italian hoverflies.
4. Training programme for hoverfly identification and the promotion of citizen science initiatives, such as “Syrphidae in northeastern Italy”.
5. Recording new data from several Italian National Parks.
6. Investigation into threats to hoverfly populations, with particular attention to endangered species, such as saproxylic fauna, and factors negatively affecting their habitats.
7. Development of new long-term monitoring schemes, necessary to track population trends on a broader temporal scale.

Taken together, these actions represent a significant step forward in addressing the existing gaps in hoverfly research and promoting the conservation of these vital pollinators and biological control agents.

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Presentations

The role of the NBFC network to investigate bleaching in *Posidonia oceanica*

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In the Mediterranean Sea the temperature increase is accelerating, affecting key species like the endemic seagrass *Posidonia oceanica*. Discoloration of *P. oceanica* leaves still attached to the shoots (bleaching, hereafter) in warm location, has recently attracted the attention of scientists. During summer 2024, *Posidonia oceanica* bleaching in Cyprus was studied through a i) mensurative experiment, aimed at estimating the spatio-temporal variability of leaf condition along a depth gradient and ii) a manipulative experiment aimed at investigating the role of light irradiation and temperature on *P. oceanica* leaf condition, through a cross-depth transplantation. Results of Generalized Linear Latent Variable Model highlighted that the maximum daily temperature was positively associated to the bleached area, which increased with higher temperatures, even though with different thermal thresholds at different depths. However, the depth-cross-transplantation experiment suggests that the response of leaf bleaching to high temperature is not a signal of stress, but rather indicates a photopigment rearrangement at different light and temperature conditions finalized to the activation of photoprotective mechanisms. This highlights that *P. oceanica* can adapt to environmental stressors even in presence of leaf bleaching. However, this study needs upscaling. The NBFC network can support a systematic data collection from all the Italian coasts on both the presence/absence of bleached meadows and on temperature regimes. This is a crucial step to investigate this phenomenon at a broad scale framing the future of *P. oceanica* meadows in a climate change scenario.

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Presentations

Simulating urban forest growth and ecosystem services with a dynamical individual-based model

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Urban forests are increasingly recognized as crucial components of resilient cities, offering a wide range of ecosystem services (ES) that benefit both people and the environment. Despite their importance, current tools for assessing ES in urban areas often rely on simplified models that overlook the complexity of ecological dynamics and the influence of external drivers such as climate. This limits their ability to support long-term, informed decision-making. We present a dynamic, individual-based model tailored for urban forests that explicitly incorporates species diversity and exogenous climatic variables to simulate the spatio-temporal dynamics of tree growth and associated ES. The model is mechanistic, capturing ecological processes such as net primary productivity, carbon storage, evapotranspiration, and air filtration. Parameters are drawn from the scientific literature and calibrated to represent common tree species in Milan, ensuring ecological realism and local applicability. The model supports the evaluation of different planting and management strategies, including scenarios based on historical practices and those optimized for species diversity. Results show significant differences in ES provision, highlighting the value of incorporating species composition in urban planning. Importantly, it enables assessment of future trajectories under changing climate conditions by integrating meteorological and pollution data as dynamic drivers of ecosystem functioning. Future developments include the simulation of species interactions—such as competition and complementarity effects—to better capture feedback within the system. This tool offers urban planners and policymakers a scientifically robust yet accessible approach to guide decision-making in the design and maintenance of urban green infrastructures.

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Presentations

Enhancing fungal biodiversity for soil remediation actions

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Fungi are increasingly recognized for their potential to remove toxic, recalcitrant compounds from contaminated soils in a sustainable and eco-friendly manner. Their enzymatic versatility enables them to degrade a wide variety of complex organic pollutants, including hydrocarbons, even under suboptimal environmental conditions.
Fungi exhibit a remarkable range of metabolic strategies, allowing them to exploit substrates with low moisture and limited nutrient availability. Additionally, many species thrive in acidic environments and contribute to further acidification through the secretion of organic acids, enhancing the solubilization and mobilization of hydrophobic pollutants.
Crucially, fungal biodiversity supports functional redundancy and metabolic flexibility across diverse environmental contexts. The presence of a rich and diverse fungal community enhances adaptation to fluctuations in pH, temperature, and oxygen availability, optimizing both growth and enzymatic activity. In this framework, enhancing fungal biodiversity - through practices such as bioaugmentation, ecological restoration, organic amendment, or fostering native fungal communities - can significantly improve the efficiency of soil remediation processes. This ecological plasticity highlights the importance of not only preserving but also actively promoting fungal diversity as a strategic asset for developing robust and adaptable bioremediation approaches, particularly in heterogeneous or degraded soils where conventional methods may fall short.

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Presentations

The Biodiversity Strategy 2025-2030 by Aboca: a model to replicate

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The overexploitation of natural resources is degrading biodiversity, with detrimental effects on all productive sectors and society.

Aboca produces 100% natural and biodegradable medical devices and food supplements, using natural substances and avoiding synthetic chemicals in production steps.

Aboca adopted the legal status of a Benefit Corporation. Aligned with its fourth Common Benefit objective, Aboca has developed a corporate strategy to manage and enhance biodiversity through a systemic approach. This strategy integrates all activities (from agricultural practices to communication) that Aboca undertakes to support biodiversity and ecosystem services. It is based on five pillars complementary the company's business model:

- Avoid: Prevent the accumulation of synthetic compounds by using natural substances.
- Reduce: Minimize negative impacts through organic farming practices.
- Restore; Regenerate: Utilize many plant species to enhance the resilience of agricultural ecosystems.
- Transform: Aboca's cultivation methods represent a valid alternative compared to conventional farming.
- Educate: Through its publishing house, museum, and educational activities, Aboca raises awareness among the public and children about the One Health principle.

A monitoring system that implements measurement standards and environmental matrices, evaluates the outcomes of the strategy, that will be presented annually in the Impact Report. This will help identify future objectives for continuous improvement. The strategy could be a guide for other companies to improve biodiversity by adapting their business model.

The document underwent a review by NBFC biodiversity experts during a workshop held on April 8th at Aboca's headquarters and is scheduled for publication in the coming months.

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Presentations

Linking alpha and beta indices for monitoring biodiversity

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Human activities impact marine biodiversity worldwide while efforts to get information about biodiversity patterns are increasing. A comprehensive understanding of the relationships between the diversity indices is key to assessing the outcome of monitoring programs. Entropy's special cases, like Shannon or Simpson's index, are frequently used in ecology to assess alpha diversity. The associated notion of divergence could be used to measure beta diversity, but it is rarely applied in ecology. In this work we link alpha and beta diversity and decompose locally the gamma diversity to provide a unifying framework. To illustrate the ecological utility of this approach and its broader applicability, we calculate alpha, beta and gamma using a large biological dataset of demersal marine species obtained by the International Bottom Trawl Survey in the Mediterranean (MEDITS). We describe a gradient of diversity, ranging from communities dominated by a few common species to those where rare species are more evenly distributed.

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Presentations

Annual dynamics of a macroalgal community on the rocky shores of Bacoli coast (Gulf of Pozzuoli, Italy): exploring trade-off in resources allocation

Ermenegilda Vitale[1,2], Simonetta Fraschetti[1,2,3], Rosa Donadio[1,2], Giovanni Libralato[1,2], Claudia Manfredonia[1], Lucia Buono[1], Carmen Arena[1,2]

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This study investigates annual changes of a macroalgal community living on the rocky shores of Bacoli coast (Gulf of Pozzuoli, Italy) to assess differences in resource allocation trade-off of three species, dominant at community level: *Dictyota spiralis, Cladophora prolifera* and *Jania pedunculata*. To this purpose, for one-year, samplings were performed monitoring physico-chemical variables of the study area, species coverage, and functional and structural ecological attributes, including photosynthetic efficiency, pigment content, antioxidants, carbohydrate, area and dry matter content. Algal coverage showed strong variability with dominance of *Dictyota* in spring and *Cladophora* and *Jania* in summer and autumn. The highest photosynthetic activity was measured in *Cladophora*. None of the three species showed signs of stress along different seasons. *Cladophora* and *Jania*, with a higher thallus dry matter content and lower specific area revealed a resource-conserving strategy and greater carbon allocation to structural biomass than *Dictyota*. Conversely, the higher thallus area and tannin concentration indicated that *Dictyota* invested carbon in photosynthetic tissues and chemical defences, adopting a growth-oriented strategy. Summer higher temperatures and irradiances determined a reduction of antioxidant activity across all species to counteract a potential photooxidative damage. Our results indicate that these species optimize the "trade-off" between the physiological cost of photosynthesis and allocation of resources to protection/defence mechanisms. Moreover, their rapid responses to seasonal fluctuations offer insights into local adaptation and ecological dynamics of macroalgae in a coastal habitat, useful to understand the effects of human threats and predict climate driven changes.

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Posters

Innovative processing technologies for valorization of underutilized fishery species: the case study of picarel (*Spicara smaris*)

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The growing awareness on environmental sustainability and human health is driving a significant change in the seafood sector, which is increasingly oriented towards circular economy principles and innovation. Valorization of underutilized Mediterranean fish species is emerging as a highly effective strategy, thanks to innovative technologies that can transform it into functional foods or ingredients, to reduce waste, and promote a sustainable use of fisheries resources.
Traditional processed seafood are usually salted, being a significant source of sodium that is recognized as a risk factor for cardiovascular disease. Recent research has focused on partially replacing sodium chloride ($NaCl$) with potassium chloride (KCl), which offers similar properties but could have some flavor limitations. The aim of the study was to develop a new innovative product replacing, up to 50%, sodium chloride ($NaCl$) with potassium chloride (KCl) in the salting of Spicara smaris, with the aim of achieving a healthier product without compromising its nutritional or sensory properties. Product quality was evaluated using a multidisciplinary approach, including sensory, biochemical, and instrumental analyses. The obtained results highlighted that the partial substitution of $NaCl$ with KCl significantly reduced the sodium content in the final product, ensuring a good protein content and a high level of ω-3 fatty acids. Sensory analysis and technological parameters showed that the use of KCl did not negatively affect the organoleptic quality. This innovation supports the production of healthier, value-added seafood ingredients, contributing to food waste reduction, sustainable resource use, and public health goals.

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Posters

Reversing the Luxury Effect: higher urban wealth does not predict bird richness in Italian cities

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The “luxury effect” describes a positive relationship between biodiversity and wealth, often observed in urban areas where rich neighborhoods support higher species richness due to greater vegetation cover. We tested this hypothesis using bird community data from six major Italian cities, sampling across neighborhoods with varying socio-economic status. We used mean property price per square meter as a proxy for local wealth and modeled its relationship with avian species richness. Contrary to expectations, we found an inverse luxury effect: bird species richness was lower in wealthier neighborhoods. This pattern may reflect different urban dynamics in the Italian context, where high-income areas are often located in historic city centers characterized by high impervious surface cover and limited green space. In contrast, suburban and peri-urban neighborhoods on the city outskirts—often less wealthy—still retain remnants of natural or semi-natural habitats such as small woodlands, agricultural patches, or unmanaged green areas, which support greater avian diversity. These findings highlight the need to consider regional urban forms and historical land-use patterns when interpreting biodiversity-wealth relationships and suggest that conservation strategies in European cities should not overlook the ecological value of urban peripheries.

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Posters

An integrated multimedia scientific communication for increasing awareness and sustainably manage biodiversity

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CNR participates in the Spoke 7 activities “Biodiversity and society: communication, education and social impact” through the Department of Earth System Sciences and Environmental Technologies, Institute for the study of Anthropogenic impacts and Sustainability in the marine environment, Institute of Environmental Geology and Geoengineering, Institute for electromagnetic sensing of the environment, Research Institute for Terrestrial Ecosystems, Institute of Marine Sciences. Thanks to the interdisciplinary experience of the experts involved and through an integrated multimedia scientific communication, researchers aimed to reach wider audiences to promote responsible behavior and a sustainable management of biodiversity. To reach a larger portion of public opinion, especially those stakeholders which have never been exposed to scientific content related to biodiversity (from industry to children), researchers used new languages, formats and methods of communication to make the central messages of the NBFC truly visible, popular and shared.

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NATIONAL BIODIVERSITY FUTURE CENTER

Posters

An integrated multimedia scientific communication for increasing awareness and sustainably manage biodiversity

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Through the launch of pilot projects, researchers combined scientific storytelling on biodiversity with comics, gamification activities, exhibition and dissemination events.

Posters

Botanical extracts in sustainable agriculture: insights from a large screening and the case of *Echium vulgare*

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Botanical extracts (BEs) are natural plant-derived substances rich in bioactive compounds, which can stimulate physiological and biochemical processes in plants. Once applied, BEs can either enhance or suppress plant growth, nutrient uptake, stress tolerance, and overall crop performance. Thus, they can be employed as sustainable, low-impact, and low-cost anti-germinative products for weed management or as plant biostimulants to promote plant resilience.

We screened the efficacy of ethanol-extracted BEs, obtained from 100 different plant species, by priming assays on tomato seeds at two concentrations (0.1% and 1%). 52 BEs were beneficial, 11 were detrimental and 33 were ineffective at both concentrations.

Among the effective, the *Echium vulgare* BE (EvBE) promoted root growth and was chosen as a candidate for further characterization. Liquid chromatography-mass spectrometry analysis (LC-MS) provided a list of the most abundant metabolites in EvBE, which is particularly enriched in rosmarinic acid and rutin. Pure rosmarinic acid and rutin were therefore tested to confirm their role as seed priming agents. Indeed, their application caused an increase in seedling root length (+31% and +18%, for rosmarinic acid and rutin, respectively) compared to untreated controls.

Moreover, EvBE was applied by foliar spray to tomato seedlings grown in standard conditions and in saline stress (150 mM NaCl). EvBE greatly improved root length and plant biomass compared to control plants (stressed but sprayed with 0.1% ethanol). Enzymatic assays are being performed to evaluate whether EvBE may play a role in the plant ROS scavenge.

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Posters

Advancing agroecosystem management through strategic cover crop selection: the role of species identity and community composition for productivity and climate change mitigation

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Cover cropping is assumed to improve soil fertility, enhance nutrient cycling, and increase soil organic carbon (C) stocks, however, its effects on nitrous oxide (N2O) emissions and soil greenhouse gas balances remain unclear. Furthermore, these outcomes depend on the cover crop species and mixture, and may change over time, but these aspects are understudied. In a three-year field experiment, we assessed the impacts of hairy vetch, rye, radish, their combinations, and a seven-species mix, on cover crop biomass production, nitrogen (N) and C inputs, subsequent crop yields (maize, sunflower, and soybean), as well as on N_2O emissions, soil macronutrients (N, P, and K), and soil C sequestration.
Hairy vetch and rye produced the highest aboveground biomass, while radish contributed to soil C inputs mostly through belowground biomass. Hairy vetch, alone or combined with rye, provided substantial N inputs (200 kg N ha^{-1} annually) but increased N_2O emissions, revealing a trade-off between soil fertility and greenhouse gas emissions. Rye and radish emitted less N^2O, with rye boosting soil organic C stocks and potassium availability. Rye-based treatments uniquely achieved a positive net soil CCO_2 balance, emphasizing their potential for climate change mitigation. Soybean yields were unaffected, but sunflower and maize had significant N uptake improvements following vetch and rye-vetch cover crops.
This study provides an unprecedentedly comprehensive field dataset underscoring the potential of using cover crops mixtures with complementary traits to balance productivity and environmental impacts. Integrating diverse species, particularly rye and vetch, can enhance ecological functions and promote sustainable crop production.

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Posters

Restoration of the habitat-forming seaweed *Ericaria amentacea* in the NW Mediterranean: From Practical Challenges to Scalable Solutions

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Marine forests constitute some of the world's most productive and diverse coastal ecosystems, yet are subject to globally increasing pressures on coastal oceans. Evidence of local or regional declines worldwide and the recent establishment of the UN Decade on Ecosystem Restoration (2021-2030) have accelerated the development of initiatives to restore marine macroalgal forests, which have historically lagged behind those of other marine ecosystems in number and size. In the Mediterranean Sea, marine macroalgal forests of the complex Cystoseira sensu lato play a valuable role as foundation species, and active restoration techniques are encouraged by European legislation, particularly after the approval of the EU Nature Restoration Law. The non-destructive method for restoration of the midlittoral canopy-forming macroalga *Ericaria amentacea* (C. Agardh) Molinari & Guiry, ex-situ outplanting, consists of three main steps: i) collection of fertile apices, ii) seedling culture in the laboratory, and iii) field deployment (i.e. outplant). Over eight annual cycles, the methodology for culture and outplant was implemented along the Italian coasts and refined. Culture conditions focused on developing cost-effective ways to enhance juvenile growth while promoting later adaptation in the field; field deployment designed to address conditions of environmental stress inherent to exposed, rocky intertidal shores. Here, we summarize our findings, providing step-by-step optimization and practical application to maximize outplant success and restoration potential of *E. amentacea*, as well as some general considerations for restoration of habitat-forming species to dynamic intertidal zones.

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Posters

Biomonitoring the health status of seabass (*Dicentrarchus labrax*) from an open sea farm in the Ligurian sea

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The present project is included in the frame of improving fish health management in aquaculture. Data are presented on evaluation of growth and the health status of the European seabass (*Dicentrarchus labrax*). A total of 6 samplings were carried out from March 2024, from 150 g weight fish until marketable size (still ongoing).
For every sampling, a wide range of biomarkers, from the individual to tissue and molecular level, were evaluated. Morphometric and biometric parameters related to growth (length, weight, HIS and K factor, as well as specific growth rate–SGR in relation to water temperature) and to sexual maturation (GSI index) were measured. In gills and liver antioxidant and biotransformation enzymatic biomarkers (catalase, GSH transferase, ethoxyresorufin-O-deethylase EROD) were investigated. The histology of the gut, liver and spleen was examined.
Preliminary results showed that morphometric analyses were not correlated with water temperature. The other results indicate a good health condition of fish with biometric analyses (HIS and K). Moreover, for enzymatic biomarkers, none of the activities showed significant differences along with growth. Results of histological analyses in *D. labrax* are in line with those of the other analyses, showing slight differences among months, while seasonality seems to be a more discriminating/divergent factor.
Once reached the commercial size, this monitoring data will provide first baseline information on the health status of farmed seabass in an open sea farm in Ligurian Sea.

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Posters

Catch me if you can: primary prey species increase predators' tolerance to urban environments in Italian cities

Vasco Avramo [1,2], Laura Limonciello [1,2,3], Pushpinder S. Jamwal[1,2], Enrico Mirone[1,2], Mirko Di Febbraro[3], Luca Chiaverini[6], Emiliano Mori[2,4], Leonardo Ancillotto[2,4], Olivia Dondina[2,5], Valerio Orioli[5], Sandro Bertolino[7], Paolo Ciucci [8], Anna Loy [3]

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In recent decades, urban settlements have rapidly expanded worldwide. Although still poorly investigated, this process is expected to have significant impacts on biodiversity and ecosystems. From January to December 2024, 47 camera traps (CTs) were deployed and monitored monthly in four cities (Campobasso, Rome, Florence, and Milan). The objective was to investigate the response of two predators occurring in urban and peri-urban environments to their primary prey. Conditional occupancy models were performed separately for two predator-prey assemblages: (1) red fox (*Vulpes vulpes*), european hare (*Lepus europaeus*), the invasive eastern cottontail rabbit (*Sylvilagus floridanus*); and (2) grey wolf (*Canis lupus*), wild boar (*Sus scrofa*), roe deer (*Capreolus capreolus*). Land cover data were extracted from the Urban Atlas within 1 km^2 (for leporids) and 2 km^2 buffers (for the other species) around each sampling site to quantify habitat composition of the study areas.
Preliminary results show that Red fox occupancy is positively influenced by the presence of both leporid species, with S. floridanus capable of maintaining the occupancy probabilities of the red fox high even in severely urbanized areas. In contrast, Grey wolf occupancy appears strongly constrained by urbanization, showing low tolerance for urban environments regardless of prey presence. However, wolf occurrence is significantly associated with both wild boar and roe deer, but only in areas with low urban cover.

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Posters

Catch me if you can: primary prey species increase predators' tolerance to urban environments in Italian cities

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These findings contribute to a better understanding of predator-prey dynamics in urban ecosystems and offer valuable insights for wildlife management, particularly in relation to large predators and invasive species in human-dominated landscapes.

Posters

Advancing the global statistical standard for thematic urban ecosystem accounts

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Building on the System of Environmental-Economic Accounting–Ecosystem Accounting, we advance thematic urban ecosystem accounting to provide a tool standardized and tailored for assessing urban sustainability. Through a comprehensive review, we identify 24 interrelated challenges—13 conceptual and 11 operational—that hinder the effective classification, delineation, and valuation of urban ecosystems and the services they supply and demand. Notably, ambiguity remains in defining urban ecosystems and determining which assets belong to them, alongside persistent gaps in capturing degradation within these systems. While many challenges overlap with those affecting other ecosystems, urban systems still lack a global classification scheme and may require a complementary "sister" condition table to account for social and technological variables when assessing degradation. By mapping these challenges, proposing targeted solutions, and identifying priority actions, we lay the groundwork for a robust, globally coherent framework for thematic urban ecosystem accounting, enhancing its relevance for urban sustainability policy.

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Posters

Monitoring marine biodiversity in Sicily: new NIS records and neglected species

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Sicily, the largest island in the Mediterranean Sea, holds a strategic position for the routes of dispersal of marine species entering the basin from the Atlantic Ocean and the Red Sea. Through case studies relating to activities carried out under the NBFC framework, this contribution aims to strengthen this assertion. The fouling communities living on nautical ropes were investigated between 2023 and 2025 in three harbours (Trapani, Palermo, and Licata). New occurrences of NIS or cryptogenic isopods (*Paranthura japonica, Mesanthura cf. romulea, Paracerceis sculpta*), amphipods (*Caprella scaura, Jassa slatteryi, Laticorophium baconi, Stenothoe georgiana*), pycnogonids (*Anoplodactylus californicus*), bivalves (*Isognomon sp., Brachidontes pharaonis*), and tunicates (*Microcosmus squamiger, Styela plicata, Distaplia bermudensis*) were detected in Trapani, while the isopod Mesanthura cf. romulea and the amphipod Laticorophium baconi were reported for the first time in Licata. The latter species and the pycnogonid *Achelia sawayai* were also newly recorded in Palermo. Contextually, rare or neglected species were also collected. These include two copepod species parasitic of ascidians (a yet unidentified botryllophilid in *Polyclinum aurantium* and *Bonnierilla similis in Styela plicata*) and the marine mite *Litarachna duboscqi*, whose record accounted for the first sighting in the central Mediterranean. These observations overall demonstrate that the local biodiversity is still not yet sufficiently explored and highlight the necessity of continuous monitoring activities to understand the dynamics of biological invasions and increase the knowledge on rare or neglected taxa

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Posters

Occurrence and species-specific patterns of phthalates in free-ranging cetaceans: evidence an emerging issues for from striped dolphins, fin whales and sperm whales living in the Pelagos Sanctuary

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Phthalate esters (PAEs), widely used as plasticisers, are ubiquitous environmental pollutants that leach into the environment. Despite their endocrine-disrupting properties, data on PAEs in the Mediterranean Sea remain scarce. This study assessed 11 PAEs in free-living cetaceans from the Pelagos Sanctuary, a key conservation area in the northwestern Mediterranean. Skin biopsies from 49 striped dolphins (*Stenella coeruleoalba*), 35 fin whales (*Balaenoptera physalus*), and 19 sperm whales (*Physeter macrocephalus*) were collected between 2019 and 2024. Blubber samples were analyzed using ultrasonic extraction and dispersive solid-phase extraction (d-SPE). Nine of the 11 PAEs were detected, with DEHP, DIBP, and DBP being the most abundant, found in over 95% of samples. DChP and DINP were consistently below detection limits. Striped dolphins exhibited the highest PAE concentrations, with significant differences compared to fin and sperm whales. Species-specific accumulation patterns emerged, with fin whales showing the highest DBP levels. These findings confirm the widespread presence of PAEs in the Mediterranean and raise concerns about their potential impacts on cetacean health and reproduction. Further research is needed to understand PAE accumulation, temporal trends, and ecological effects. Such studies are crucial for developing mitigation strategies to protect marine biodiversity and ensure the long-term survival of these species.

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Posters

Nature-based Solutions in European environmental policy and the NBFC contribution

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Nature-based Solutions (NbS) are essential to support the implementation of Nature Restoration Regulation and Global Biodiversity Framework. NbS have a multifunctional approach, simultaneously providing economic, environmental, human well-being, and at their core, biodiversity benefits. This multifunctionality, together with evidence-based adaptive management, guarantee that problem solving through NbS brings benefits in the long term, in a holistic perspective, supporting transformative change.
Over the last decade, the European Union and Member States have made significant efforts to fund research and implementation projects related to NbS, such as dedicated Horizon Programmes and flagship within the European Partnership on biodiversity, Biodiversa(+).
To avoid knowledge dispersion while capitalizing on experiences, networking is key, as demonstrated by the success of the NetworkNature project. NetworkNature is a multi stakeholder project that was funded to create a harmonized NbS definition and evaluation framework, also including stakeholders' collaborative experiences on specific topics (i.e., the Task forces), or focused on regional and national context (i.e., the NbS Hubs).
The National Biodiversity Future Center (NBFC) participated in this capitalization process by two main actions. On the one hand, at the international level, the NBFC collaborated with Biodiversa+ in elaborating on the different ways to uptake knowledge from NbS, with a special focus on digital instruments developed over the last 10 years, for cataloguing and building knowledge on NbS. On the other hand, at the national level, the NBFC supported the NBS Italy Hub, which was created under the NetworkNature umbrella and is now recognized as a relevant stakeholder at the European level.

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Posters

Emodin and aloe-emodin reduce cell growth and disrupt metabolic plasticity in human melanoma cells

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Melanoma is an aggressive skin cancer with metabolic intratumor heterogeneity that drives its progression and therapy resistance. Natural anthraquinones, such as emodin and aloe-emodin, exhibit anti-cancer properties, but their effects on metabolic plasticity remain unclear. This study evaluates their impact on proliferation and metabolic pathways in heterogeneous melanoma human model cell lines.
COLO 800, COLO 794, and A375 melanoma cell lines representing distinct metabolic phenotypes were analyzed. Targeted and untargeted metabolomics analysis integrated with seahorse assays were performed to assess the effects of emodin and aloe-emodin on cell proliferation, mitochondrial function, and redox homeostasis. Glucose tracing using [U-$^{13}C_6$] glucose and metabolic flux analysis (MFA) were carried out to evaluate glycolysis and TCA cycle dynamics.
Emodin and aloe-emodin inhibited proliferation by disrupting glycolysis, oxidative phosphorylation, and energy production across all cell lines. Both compounds impaired glucose metabolism, reduced TCA cycle intermediates, and induced mitochondrial ROS accumulation, causing oxidative stress and redox imbalance. Despite intrinsic metabolic differences, COLO 800 and COLO 794 upregulated antioxidant defenses; A375 enhanced one-carbon metabolism and amino acid pathways to sustain redox balance and nucleotide biosynthesis.
Emodin and aloe-emodin disrupt metabolic plasticity of melanoma cells by impairing glycolysis, mitochondrial function, and redox homeostasis. Their ability to target metabolic vulnerabilities across diverse phenotypes highlights their therapeutic potential for overcoming resistance mechanisms and advancing melanoma treatment strategies.

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Posters

Seed priming applied to forest tree species: innovative strategies to rescue biodiversity

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Long-term seed storage is the most effective approach for safeguarding plant biodiversity. Storage parameters that influence seed quality include temperature, moisture content, and oxygen pressure, however seed desiccation tolerance (DT) is a crucial endogenous factor. Poplar (*Populus spp*.) seeds have a very short life span, due to low DT, high water content at maturity, and high metabolic activity at dehiscence. Reduced seed viability significantly impairs breeding and genetic conservation programs, with implications for the restoration of compromised natural sites. The availability of tailored seed priming treatments represents a promising option to address seed quality issues in poplars. The advantages of seed priming, ranging from improved germination to enhanced stress resistance, are well documented in multiple species. The present study focuses on *Populus alba L.* and *Populus nigra* L. as model plants to assess i) the dynamics of water uptake and loss in fresh/aged seeds, ii) the efficacy of antioxidant compounds as priming agents able to rescue seed viability in long-term storage, iii) the molecular players contributing to the seed ability to mitigate oxidative and genotoxic damage accumulated in deteriorated lots. Tailored seed priming treatments are currently under validation whereas high-throughput molecular characterization of the seed pre-germinative metabolism is in progress, using metabolomics and ionomics-based approaches. This will lead to species/genotype-specific guidelines for improving viability and germination performance applied to recalcitrant/intermediate seeds of forest trees, easily accessible to end-users.

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Posters

Enhancing ecosystem recovery: the role of digital plant phenotyping in supporting Nature-based Solutions

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The structural, physiological, and biochemical properties of vegetation are fundamental to understanding ecosystem biodiversity, functionality, and resilience. As primary producers and structural components of terrestrial ecosystems, plants are critical regulators of biogeochemical cycles and are often employed as bioindicators due to their sensitivity to environmental changes and their role in modulating ecosystem services (ES). These services include provisioning (e.g., food, fuel), regulating (e.g., carbon sequestration, microclimate stabilization), and remediation functions (e.g., phytoremediation of pollutants in soil and water matrices). A growing concern in ecosystem degradation is the widespread increase in soil and water salinity, driven by anthropogenic and climatic pressures. In arid and semi-arid regions such as the Mediterranean basin, salinization is exacerbated by sea level rise, irrigation with low-quality or saline water, elevated evapotranspiration, and shifting precipitation patterns due to climate change. These factors collectively threaten plant productivity, biodiversity, and the long-term viability of Nature-based Solutions (NbS) for ecosystem restoration. Digital Plant Phenotyping (DPP) represents a transformative tool in the implementation of NbS by enabling high-throughput, non-invasive, and temporally resolved acquisition of plant functional traits. This technology integrates advanced imaging systems, remote sensing platforms (e.g., UAVs, hyperspectral sensors), and machine learning algorithms to quantify morphophysiological responses under variable environmental conditions. In the context of phytoremediation and saline stress tolerance, DPP facilitates the identification and selection of plant taxa exhibiting adaptive traits such as osmotic adjustment, ion exclusion, and anatomical plasticity. By aligning phenotypic profiles with specific ecological functions, DPP enhances the precision and efficacy of restoration interventions, allowing for trait-based species selection tailored to environmental constraints. Such targeted approaches improve the resilience and scalability of NbS applications, particularly in degraded or salinized landscapes.

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Posters

Enhancing ecosystem recovery: the role of digital plant phenotyping in supporting Nature-based Solutions

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In a recent study, DPP methodologies were applied to assess salinity stress responses in characteristic Mediterranean maquis species. The experimental framework involved a six-month trial conducted in semi-controlled greenhouse conditions, where key taxa—gymnosperms (*Pinus pinaster, P. halepensis, Cupressus sempervirens*) and evergreen sclerophyllous angiosperms (*Myrtus communis, Arbutus unedo*)—were subjected to varying salinity treatments. The phenotypic datasets captured morphological (e.g., leaf area, plant architecture), physiological (e.g., stomatal conductance, chlorophyll fluorescence), and biochemical (e.g., proline accumulation, ion content) parameters, providing integrative insights into species-specific salt tolerance mechanisms. These preliminary findings underscore the potential of DPP to support trait-based ecological engineering in saline-affected environments and offer a scalable framework for integrating advanced phenotyping into adaptive management strategies for climate-resilient ecosystem restoration.

Posters

Impact of PM2.5 on adipose tissue activities and breast cancer progression

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Both WHO and IARC classified air pollution as a human carcinogen. Particulate matter (PM) is the most harmful among all the atmospheric pollutants. The deleterious effects of PM are not limited to the lung. Indeed, cohort studies support PM2.5 as associated with breast cancer (BC) incidence and mortality. A relevant contribution toward BC progression is provided by adipose Tumor MicroEnvironment (TME). Adipose cells adapt their biological profile and secretome in response to environmental changes. PM2.5 may reach adipose cells and drive adipocytes toward a proinflammatory/dysfunctional phenotype. In line with this, the increase of metabolic disorders paralleled with population's exposed to unhealthy urbanized air zones. Notably, metabolic disorders involving adipose dysfunctions associate with BC progression. To investigate the impact of PM2.5 exposure on adipose cells and, in turn, on BC phenotype, mammary AT biopsies - from women undergoing surgical mammary reduction, free of neoplastic, metabolic, endocrine diseases - have been collected. Tissues have been exposed to PM2.5 before isolation of mature adipocytes to evaluate mitochondrial activity, gene expression/protein secretion of inflammatory molecules, insulin responsiveness and glucose uptake ability. Then, conditioned media from PM2.5-exposed AT-derived adipocytes have been collected to assess 3D cultures with (ER+) BC cells and evaluate spheroids number, diameter and viability. Overall, our data highlighted that PM2.5 impacts onto AT by promoting the acquisition of a dysmetabolic/inflammatory phenotype in adipocytes that, in turn, sustain CSC-like properties in BC cells. Thus, PM2.5 exposure perturbs the communication existing between adipose and tumor cells in TME and contributes to BC progression.

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Posters

PlayDecide: facilitating dialogue on biodiversity and coexistence through a discussion game

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Human impact on the natural environment has grown dramatically in recent decades. Expanding human activities have reduced the space and resources available to non-human species, and, combined with the escalating impacts of climate change, are driving the current decline in biodiversity. In response to this deepening crisis, various initiatives have been taken to protect and restore biodiversity, which in some cases have led to conflicting coexistence scenarios.
At the heart of this issue lies an essential and open question: how can we use natural resources equitably and share the planet with other living beings? What values should underpin our relationship with non-human nature?
To encourage discussion around these crucial issues, we created the discussion game “Where the wild beings are”, based on the PlayDecide format. PlayDecide is a collaborative game that allows participants to familiarise themselves with an issue, look at it from multiple perspectives, reflect on their own beliefs, and engage in constructive conversation.
Our version of the game focuses on human-wildlife interactions, with particular emphasis on the Euro-Mediterranean region. We developed a set of cards to stimulate discussion, along with four reference policy positions based on the value frames outlined in the IPBES “Values Assessment Report” (2022). These tools guide players in articulating their views and working together towards a shared position.
We have begun testing the game in university settings and at thematic festivals, gathering feedback and conducting an evaluation survey to assess how the game experience influences participants’ pre-existing positions on the topic.

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Posters

Preliminary studies on the role of bioactive molecules in the modulation of the ETosis process: an innovative approach between resource and sustainability.

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ETosis is a defense mechanism implemented by the immune system of vertebrates and invertebrates and is a type of cell death that involves the release of chromatin from inflammatory cells, determining the formation of extracellular traps (ETs) and the death of target microorganisms. The down- or up- -regulation of ETosis may lead to the onset of auto-immune diseases or chronic inflammation and carcinogenesis, respectively. In our study, natural products were tested for their ability to modulate ETosis and inflammation. Therefore, RAW 264.7 murine macrophages were immunostimulated with E.coli lipopolysaccharide (LPS) and co-treated using extracts of leaves (GLE) and rhizomes (RE) from *P.oceanica*, polyphenols extracted from olive mill wastewater (OMW)4 or from the exoskeleton of *P.clarkii* and *C.sapidus*. ET formation was monitored by evaluating spectrophotometrically the amount of extracellular DNA (exDNA) in control conditions and in the presence of each extract. A decrease in the release of exDNA was found following the co-treatment with GLE and mainly OMW. Parallel ELISA assays for TNF-α and IL-6 secretion also confirmed the anti-inflammatory activity of both extracts. Preliminary MTT assay7 and Griess reactions were performed using polyphenols from OMW in order to evaluate the dose-response effect and the anti-inflammatory capacity of the preparation. The preliminary data obtained represent a good starting point for a deeper molecular investigation on the beneficial effects of the biomolecules contained in the extracts under study, especially related to the modulation of the ETosis and inflammatory processes, also ensuring an ecological and sustainable approach.

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Posters

Filamentous actinomycetes from hotspots of microbial diversity as sources of novel antibiotics

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Antimicrobial resistance (AMR) in pathogenic bacteria represents a major global health crisis, calling for urgent action to combat it, including the discovery and development of novel chemical entities capable of addressing this 'silent pandemic'. In this context, the research project ANTIDOTES aims at the discovery of new antibiotics through the bioprospecting of filamentous actinomycetes from specific microbial diversity hotspots, characterized by extreme conditions of varying nature, which force microorganisms to produce antibiotics and other bioactive metabolites as an adaptive response [1]. One area of focus is urban areas characterized by high anthropogenic impact, where the presence of chemical pollutants, heavy metals, and other contaminants creates a never-ending war for colonization. Another focus is marine microbial communities from Terra Nova Bay (Ross Sea, Antarctica), an extreme and still underexplored environment where microorganisms must develop unique physiological features to survive harsh and constantly shifting conditions, largely unaffected by human activities [2]. For both ecological niches, we have isolated a collection of filamentous actinomycetes, which have been morphologically de-replicated and are currently being fermented under a variety of cultivation conditions, both in liquid and solid media. The resulting library of extracts will be subjected to high-throughput screening against a panel of multidrug-resistant pathogens, followed by activity-guided purification of the bioactive molecules produced, along with their structural and biological characterization. Hopefully, our project will contribute in the identification of novel natural products to counteract the devastating effects of AMR.

[1] Bisaccia et al. (2025). Antibiotics. 14:394.
[2] Bisaccia et al. (2025). Environ. Microbiol. 27:e70045.

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Posters

Cities and biodiversity: barriers, strategies, and perspectives from a multi-site qualitative study

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Urban areas are increasingly recognized as pivotal arenas in the ecological transition. Yet, the integration of biodiversity into urban policy frameworks remains a complex and often marginal endeavor, constrained by entrenched institutional silos and the dominance of more established policy domains.

Within the framework of the National Biodiversity Future Center (NBFC), a qualitative inquiry was conducted to investigate how biodiversity is being addressed in Italian urban contexts. The study focused on four cities—Milan, Florence, Genoa, and Palermo—and drew on semi-structured interviews with municipal officials and sectoral professionals involved in urban green infrastructure, spatial planning, and environmental governance.

Findings indicate recurrent challenges: the fragmentation of responsibilities across administrative levels and departments; limited continuity of interventions due to the absence of structural funding mechanisms; and a general lack of indicators and tools for assessing urban biodiversity. From a communicative standpoint, biodiversity is frequently construed as a technical or peripheral issue, resulting in limited civic engagement and low public salience.

Nevertheless, several enabling practices are emerging. These include urban rewilding and co-design initiatives, citizen science and educational outreach programs, and the establishment of cross-sectoral working groups aimed at fostering integrated approaches. Participation in European projects and transnational networks has further enabled experimentation with innovative governance models, though institutional mainstreaming remains an open challenge.

This investigation contributes to the construction of an interpretative and operational framework through which cities can assume a more proactive role in biodiversity conservation, in alignment with broader objectives of ecological transition and urban resilience articulated by the NBFC.

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Posters

Multi-level approach for the study of air pollution impact on health

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Diesel exhaust particles (DEP), a major component of traffic-related air pollution, are emerging as key factors to adverse health effects in terms of neuroinflammation and oxidative stress.
This study represents a model for multi-level investigations into environmental health risks, exploring the systemic impact of DEP exposure in healthy and disease-relevant mouse models, exploiting a physiological pollutant administration route (inExpose® system) and an in vivo molecular imaging combined with epigenomic analysis for the readout.
For this study, healthy male C57Bl/6 mice (n=10) were divided into saline (controls, n=2), low-dose (n=4, 1,5 mg/ml) and high-dose (n=4, 3 mg/ml) DEP exposure. The day after nose-only single-dose exposure of 15 minutes, all animals underwent whole-body PET/CT scans with [18F]FDG, as a marker of metabolism and inflammation, and were sacrificed thereafter for blood and organs collection for miRNA profiling with RT-PCR. Radiotracer uptake at the organ level was quantified as standardized uptake value (SUVmean).
Mice exposed to DEP showed an increased FDG uptake in lung compared to the controls that would appear to be dose dependent. Transcriptomic analysis revealed upregulation of cerebral TGF- after low-dose and high-dose DEP exposure. Alteration in microRNA profiling was observed in both brain and lung tissue, highlighting a role of miRNA involved in inflammatory pathways (inflamma-miR) in the response to DEP exposure.

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Posters

Production of carotenoids in *Rhodosporidium toruloides* from residual lignocellulosic biomasses

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Microbial diversity is a plentiful repository for the development of biorefineries based on residual biomasses. In this work we focus on the use of the yeast *Rhodosporidium toruloides*, known for the ability to consume pentose and hexose sugars, and to withstand several inhibitory compounds that might arise from lignocellulosic biomasses. At the same time, it naturally produces valuable compounds (e.g. carotenoids); nevertheless, its potential is not yet fully exploited. To explore biodiversity in terms of raw material we used the bark and wood of sessile oak and mulberry trees obtained from the maintenance of the Besozza Park (Pioltello, MI). Their lignocellulosic composition can provide both fermentable sugars (released by enzymatic hydrolysis) and lignin moiety, which can be valorised as biopolymer for the production of nanocapsules.

The first step of the process involves the hydrolysis of the residual biomasses to obtain growth media for the yeast. The concentration of sugars and nitrogen sources derived from mulberry and sessile oak wood and bark were analysed. These data, combined with the growth kinetics of *R. toruloides*, demonstrate that they are suitable substrates for growth and for carotenoids production too, which were analysed and quantified by flow-injection analysis coupled with mass spectrometry (FIA-MS). To fully utilize the waste biomass, adhering to the principles of bioeconomy and circular economy, the residual lignin from enzymatic hydrolysis is used to produce nanocapsules, which can host yeast-derived carotenoids as cargo for several applications.

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Posters

Updated insights into Elasmobranch catch composition by fishing gear in the Mediterranean Sea: a meta-analysis of scientific literature

Mohamed K. Besbes[1], Fabio Falsone[2], Giacomo Sardo[2], Michele L. Geraci[2], Gabriele Di Bona[2], Fabio Fiorentino[2,3], Germana Garofalo[2], Federico Quattrocchi[1,4], Sergio Vitale[2]

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The Mediterranean Sea is a biodiversity hotspot for elasmobranchs, however intense fishing pressure has led to their frequent capture, with some species being targeted directly. Thus, understanding the impacts of fisheries on these species is crucial.
This work compiles information from 233 peer-reviewed articles using keywords related to commercial elasmobranchs catches. Data was categorized by operational modality (active/passive) and the habitat (pelagic/benthic) where these operations occur, referred to hence-forward as “Gear category”. Species occurrences were analysed based on gear category, macro-area, IUCN status, number of articles and CPUE.
Findings show that the Eastern Mediterranean has the widest range of gear categories catching elasmobranchs. “Active-Pelagic” gears (pelagic-trawlers and purse-seines) are missing for Western and Central Mediterranean areas, while “Passive-Benthic” gears (trammel-nets, gillnets, traps and benthic-longlines) were not reported for the Adriatic Sea. The “Passive-Benthic” gears seemingly catch more batoid species than sharks, unlike all other gear categories.
As for conservation state, “Passive-Pelagic” (Pelagic-longlines, driftnets and tonnaras) and “Active-Benthic” gears catch more vulnerable elasmobranchs species, while “Active-Pelagic” gears have the lowest capture diversity. Most shark species caught are considered vulnerable and constitute 50-89% of gears’ shark catches, except for “Passive-Benthic” gears (45%). For batoids, more low-threatened species are reported than endangered species and they account for 37%-57% of batoid captures everywhere, except in the Eastern Mediterranean (“Passive-Pelagic” gears report 75% of species captured).

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These patterns highlight gaps in knowledge and could help to prioritize efforts toward under-researched regions, gears and species (particularly sharks) many of which remain unassessed in the Mediterranean.

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Posters

Stakeholders outreach: essential scientific dissemination tools at the Biodiversity Festival

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The Biodiversity Festival represents the final event of a training and dissemination path in the field of knowledge and protection of marine biodiversity aimed at local stakeholders in the Capo Granitola area. The undisputed protagonist of this activity is the scientific staff of the CNR-IAS of Capo Granitola, with many years of experience in the dissemination and valorization of scientific results obtained. Over the last 2 years, within the framework of Spoke 7, Biodiversity And Society, the value of biodiversity and its protection and conservation have been disseminated through various activities: educational visits by students and associations to the CNR-IAS of Capo Granitola, "Biodiversity Open Day" and “At the school of Biodiversity” aimed at students of the "Pirandello-Bosco" School of Campobello di Mazara, participation at conferences of local associations, collaboration with the Coast Guard in the realization of two editions of the National Day Sea, organization of scientific workshops on the importance of biodiversity for teachers of local schools (Mazara del Vallo, Marsala, Campobello di Mazara and Castelvetrano).

The aim of all the activities was to promote the value of biodiversity among stakeholders through the dissemination of scientific research, promoting direct contact between science and society. Actions and languages such as the narration of researchers, the presentation of scientific results with photos, videos, documentaries and the use of the teaching methodology of "touching with your hands" have allowed the learning of science, hostile to many, through edutainment, an innovative form of communication and playful learning because it is interesting and curious.

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Posters

Exploring the morphological variability of octocoral sclerites: a case study

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Biodiversity assessments rely on species identification, yet many marine species remain poorly delineated from the taxonomic point of view. In octocorals, the shape, size, and ornamentation of discrete microskeletal carbonate structures called sclerites are considered key taxonomic features. However, the high morphological plasticity of sclerites often hampers reliable species identification, and this variability has been poorly explored in the literature. The present study investigates the Mediterranean red coral *Corallium rubrum* (Linnaeus, 1758) as a case study to address this issue. Fifty-seven colonies were analysed, collected from four natural populations distributed across a broad geographic (Portofino, Sardinian coasts, southeastern Tyrrhenian Sea, and Apulian coasts) and bathymetric (30–125 m) range. 100 capstan and 50 cross sclerites were measured for each colony, yielding a dataset of 8,550 sclerites.
Discrete morphological variability was observed among sites, with Sardinian colonies showing the largest sclerites (70.1 ± 0.9 μm) and those from Portofino the smallest (65.5 ± 0.8 μm). A potential correlation between sclerite size and environmental (depth, latitude, longitude) and morphometric (height, width, number of apexes, branch length, and weight) parameters was assessed. Depth emerged as the only factor showing a strong linear correlation with the length of both capstans and crosses (R^2 0.99), revealing a significant increase in deeper (≥ 60 m) colonies. Further studies, including additional octocoral taxa and a broader spatial/bathymetric coverage, are needed to validate these patterns and explore other potential biotic and abiotic influences.

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Posters

Development of an interactive online taxonomic guide to freshwater oligochaetes

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Oligochaetes have always posed a challenge in faunistic studies conducted in freshwater environments, due to their complex identification at the species level, which requires a careful microscopic analysis. Sexual organs need to be developed to allow species identification, but in some cases, finding mature oligochaetes is quite rare. Therefore, the idea was proposed to create for the first time a photographic identification key that considers all external morphological characteristics and internal sexual traits, based on years of sampling carried in lentic and lotic environments by CNR-IRSA of Verbania Pallanza. The idea arose from an increasing demand for species identification related to monitoring activities carried in accordance with the Water Framework Directive (2000/60/EC) for assessing the ecological status of freshwater environments. It was strongly supported by the National Biodiversity Future Center, which promotes conservation, restoration, monitoring, and enhancement activities for Italian biodiversity.
The key, along with all related images, will be hosted on the LifeWatch Italy digital infrastructure (LifeWatch ERIC national node), the European e-Science and Technology infrastructure dedicated to research in biodiversity and ecosystems. The key adheres to the FAIR principles, ensuring that all content is fully shareable and easily accessible online. Concurrently, we develop a comprehensive dataset that encompasses the list of Italian species and their associated metadata as a valuable complement to the key, being created within the ITINERIS project activities.
Here, we outline the key steps that contribute to its creation, with the aim of facilitating the work of taxonomists at the national level in the future.

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Posters

Visible Near Infra-Red hyperspectral reflectance imaging in one-health aging project

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Visible Near Infra-Red Hyperspectral Reflectance Imaging (VisNIR-HRI) is a non-invasive methodology that monitor the spectral response of the sample surface in the region of 400-1000 nm of the electromagnetic spectrum. The experimental data are 3D hypercubes that associate the reflectance of each point of the surface with its spatial localization. In the context of the project "Integrated innovative technologies for the development of a One-Health approach in the elderly population (One-Health Aging)", VisNIR-HRI was used in an innovative approach to obtain imaging biomarkers of skin's modifications due to aging. The approach was integrated with information regarding exposome factors (salivary microRNA analysis, metabolomic analyses on sweat, lifestyle and diet information obtained by questionnaire administration, neurological functionality assessment,...) in order to identify multiparametric biomarkers of healthy aging.
VisNIR-HRI has been employed for monitoring the back- and front-side of the hands of a cohort of 124 healthy volunteers aged ≥ 40 years. Hypercubes analysis included two methods to define imaging biomarkers: on the one hand, the spectral dimension of the data is being investigated to identify significant spectral bands and define spectral coefficients. On the other, texture analysis was applied to hypercubes to obtain texture features of the skin.
Up to 10 bands were identified on visible spectral range and 18 textural features were extracted using a customized extraction in pyradiomics.
Feature selection will be applied in order to extract non-redundant imaging biomarkers to be correlated with exposome, molecular biology and metabolomic data for finding out non-invasive integrated biomarkers of aging process.

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Posters

Integrating lifestyle and nutrition into the urban exposome: a multidimensional approach to assess environmental impacts on human health

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Urban exposure influences human health through complex interactions among environmental factors, individual behaviors, and biological responses. The IDEA study investigates the urban exposome (the totality of environmental exposures and their biological effects) through three components: the general external exposome (urban air pollutants), the specific external exposome (lifestyle, occupational history), and the internal exposome (oxidative stress, inflammation, epigenetic changes). Particularly, lifestyle and dietary habits impact metabolic regulation, inflammatory responses, and oxidative stress, amplifying or mitigating the biological effects of air pollution.

IDEA involves 100 healthy workers with low exposure to air pollutants (administrative staff under occupational health surveillance by ICS Maugeri, Pavia), and 100 individuals highly exposed (police officers, taxi and bus drivers). Lifestyle and nutritional assessments include anthropometric measurements (weight, height, BMI, waist circumference); bioelectrical impedance analysis for body composition and nutritional status; validated questionnaires covering physical activity, dietary habits, sleep quality, quality of life, along with structured interviews on smoking and alcohol consumption.

By integrating environmental, biological, and behavioral data, IDEA aims to develop a personalized functional exposome model to assess the combined impact of air pollution, nutrition, and lifestyle on inflammation, oxidative stress, and epigenetic modulation. Including lifestyle and nutrition factors allows for a comprehensive understanding of cumulative exposures.

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Posters

Integrating lifestyle and nutrition into the urban exposome: a multidimensional approach to assess environmental impacts on human health

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The recruitment of healthy individuals enables comparison with urban cohorts affected by chronic diseases. IDEA will support predictive models, inform public health strategies, and evaluate nature-based solutions and urban biodiversity as tools to reduce health risks and promote sustainable urban living.

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Posters

Enzymatic hydrolysis of agro-industrial waste to produce bioactive molecules

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The agri-food industry generates every year a considerable amount of waste residues (WR) that negatively impacts the environment and the economic well-being of people. In a circular economy context focused on by-products recovery, enzyme-assisted extraction of compounds can represent a valuable option than traditional non-enzymatic extraction to convert WR into value-added products. In this study, different agro-industrial WR were subjected to enzymatic hydrolysis by means of endo-glycosyl hydrolases and endo-proteases to produce oligosaccharides and peptides that will be tested for their bioactivity. Each biomass was pretreated to remove lignin, and thermogravimetric analysis (TGA) was performed to obtain an indication of the impact of the thermal alkaline pretreatment on biomasses, with positive results. Then, the pretreated WR were enzymatically hydrolysed at different enzyme to substrate (E/S) ratio (IU/g), using commercially available endo-glycosyl hydrolases (e.g., endo-1,4-β-D-glucanase and endo-1,4-β-Xylanase) and in-house produced xylanases. The obtained hydrolysates were analysed via HPAEC-PAD, showing the presence of low molecular weight oligosaccharides of glucose and xylose (degree of polymerization 2-5) as well as unidentified peaks related to higher molecular weight oligosaccharides. On the other hand, proteins extracted from each biomass were subjected to hydrolysis by commercial endoproteases, e.g. Alcalase, trypsin (i.e., serine endoproteases) and pepsin (i.e., an aspartic endoprotease) at different E/S ratios. Reactions were analysed by SDS-PAGE and mass spectrometry, confirming the hydrolysis of high molecular weight proteins after a few hours of digestion. Different bioactivities of the obtained hydrolysates are under investigation, and process parameters tuned to maximize the yield of bioactive molecules.

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Posters

Unlocking the potential of Herbarium Patavinum collections: from digitization to the multidisciplinary study of Silvia Zenari's specimens

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Herbaria represent an extensive reservoir of information, playing a key role in the studies of plant biodiversity and its changes over time and across spatial scales. Not the least, they are important in the reconstruction of the history of botanists and their voyages.

Nowadays, the Herbarium Patavinum (PAD), located at the Botanical Garden of the University of Padova, is involved in a large-scale digitization project promoted by NBFC in Florence, representing a fundamental step to make the data accessible.

Among the PAD collections included in this project there are the specimens collected by the Italian botanist Silvia Zenari (1895-1956). Zenari collected most of her specimens in the North-eastern Alps, putting together an estimated collection of 20 000 specimens, but with additional botanical expeditions in the XX century Italian oversea colonies.

Currently, we are working on Zenari's specimens collected in Libya in 1932, in order to characterize her trip in North Africa and this peculiar portion of her collection, both in terms of historical and taxonomical value.

We are investigating Zenari's collections using a multidisciplinary approach, including contacting her heirs and combining data from archival research (e.g. archives of University of Padua), online open repositories (e.g. GBIF), curators of museums and herbaria (e.g. Italian Central Herbarium). We aim to a) reconstruct Zenari's story, including her botanical expeditions in Italy and abroad, b) understand her contribution to the Herbarium Patavinum and in general to botanical studies, c) digitize and valorize Zenari's herbarium collections as cultural and botanical heritage.

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Posters

Climate-induced predation pressure: the dual threat to Mediterranean reef-building corals

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Biotic interactions are key drivers of ecosystem structure and function. Climate change can profoundly alter these interactions by modifying species' physiological responses, tolerance thresholds, and distributions, ultimately determining ecological "winners" and "losers" under shifting conditions. Here, we investigate the intensification of interactions between two key Mediterranean reef-building corals (*Astroides calycularis* and *Cladocora caespitosa*) and a thermophilic, range-expanding predator, the fireworm (*Hermodice carunculata*), in the context of ocean warming. Thermal performance data for all species, derived from experiments and literature, were used to identify optimal temperatures and upper tolerance limits. Fireworm feeding behaviour on both coral species was also quantified and modelled. Trait-based mapping revealed that current and projected sea temperatures exceed the upper thermal limits of the habitat-forming corals, increasing their vulnerability. In contrast, warming favours *H. carunculata* by enhancing its metabolic and predatory performance and supporting its poleward expansion. By integrating species-specific thermal sensitivity with predator feeding efficiency, we developed a vulnerability index to assess the relative risk to reef-forming species. Results suggest that warming and predation act synergistically to threaten the structural complexity of these habitats, with potentially severe implications for biodiversity.

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Posters

Exploring the spectral and thermal response of forest habitats

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Satellite imagery repositories represent a treasure trove of archived data documenting Earth's systems. Multi-year satellite observations offer an opportunity to assess variation in electromagnetic response of natural and anthropic surfaces. This variability may reflect environmental characteristics or sensitivity to environmental changes, providing valuable insights for ecological monitoring.

This study explored the spectral and thermal responses of various forest habitats in the Molise region, Italy, using satellite data from the vegetative season across multiple years. Spectral indices were analyzed to investigate phenological variability, while thermal data provided complementary information on environmental conditions. The main objective was to assess whether these remote sensing metrics varied across forest habitat types and, if so, whether such differences reflect underlying ecological features.

Forest habitat information was obtained from the "Carta della Natura", a comprehensive cartographic product detailing regional ecosystems and habitats. This chart facilitated the identification of the most extensive forest types, their degree of ecological value and anthropic pressure. Satellite spectral and thermal information, including several vegetation indices and Land Surface Temperature (LST), was derived from Landsat 8 imagery. A 10% stratified sampling was performed to extract forest habitats pixel data for years 2020-2023. A Generalized Linear Mixed Model (GLMM) showed that significant differences exist in thermal and spectral responses among the different forest habitats analyzed. These differences appear to be associated with the ecological value of the habitats, reinforcing the potential of satellite imagery as a reliable tool for long-term habitat monitoring and assessment.

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Posters

A deep-water rhodolith bed off the Licosa Cape (Tyrrhenian sea, Italy)

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The CORSUB project (PRIN 2022RKHBMB) takes an interdisciplinary approach to the study of enigmatic morphological structures found on submerged terraces around Punta Licosa (Cilento Peninsula, Campania Region). These features are sub-circular to polygonal, slightly convex structures located at depths between 78 and 83 m, each measuring a few m in diameter and rising no more than 50 cm at their center. ROV surveys of this area have revealed a seabed composed of coarse detritic sediment with rhodoliths forming a bed. The seafloor also shows frequent bioturbation by epifaunal and semi-infaunal organisms. The box corer we collected allowed us to describe the rhodoliths and the sediment in detail. The dominant rhodolith morphotype consists of the boxwork type and only rarely the smaller praline type. Interestingly, they show only a thin layer of living crustose coralline algae crusts, whereas they often show clear signs of muddying due to apparent scarce mobility or immobility. CT-scan imaging and cutting show that rhodoliths have a complex inner structure with an apparent polarity in development and porosity filled with mud. The associated mollusk bio- and thanatocoenosis includes species typical of coastal detritic and muddy detritic environments.
Rhodolith beds are recognized by the European Community as priority marine benthic habitats due to their importance as biodiversity hotspots. Exploration of the mesophotic zone clearly shows that calcareous red algae are able to develop such habitats in relatively deep environments, which are therefore of interest and strategic importance for the conservation and management of marine resources.

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Posters

A kit for enhancing urban biodiversity: the establishment of nature in small green areas of the city

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In recent decades, human activities have highly affected global biodiversity through intensive agriculture, pollution and urbanization, leading to a significant decline in organism diversity and abundance. In particular, habitat fragmentation, common in urban areas, can reduce species richness and genetic variation, limiting gene flow within both plant and animal populations.

In this context, it is crucial to implement strategies that support and preserve animal communities, even in highly urbanized contexts such as large cities.

To address this challenge, we developed the "Urban Biodiversity Enhancement kit", which aims to increase biodiversity at the local scale through the active participation of associations and citizens, promoting sustainability, environmental education and the enhancement of habitat quality in green spaces. The kit is composed of a bird nest box, a solitary bee's nest and a mix of native, insect-pollinated, herbaceous seeds with bioinoculants to enhance seed germination.

The project involved 18 Italian big cities, with a total of 175 areas managed by 103 different local entities, including community gardens, allotments, universities and schools. This variety of entities provides a solid basis in order to integrate environmental actions into educational activities and citizen involvement. Participating entities were engaged in monitoring and observational tasks and scientific data collection to evaluate the kit's impact on both biodiversity and public perception.

The initiative not only supported the creation of microhabitats for biodiversity in urban areas but also increased public awareness on the importance of environmental conservation.

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Posters

Ecological and functional heterogeneity of fish assemblages in vent-associated habitats of Panarea Island (Southern Tyrrhenian, Italy)

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Hydrothermal vents are unique ecosystems that play a crucial role in various biogeochemical and ecological processes. In addition to influencing global geochemical cycles, these systems may sustain unexpectedly rich communities of sessile, vagile, and migratory organisms. The Aeolian volcanic complex, located in Sicilian waters (Southern Tyrrhenian), encompasses multiple shallow hydrothermal vents (l200 m depth). Although the benthic communities have been the focus of extensive research, their fish assemblages remain poorly characterized. To address this knowledge gap, we conducted a non-destructive survey using Baited Remote Underwater Videos (BRUVs) from October 2023 to February 2025 around Panarea Island, at depths between 30 and 90 meters. We recorded species richness and relative abundance (MaxN/h) across three main vent-associated habitats: soft sediments, chimneys and rocks. To move beyond species-level patterns, we incorporated a trait-based approach by compiling data on species' functional traits (e.g., body size, habitat use, trophic ecology, behaviour). This allowed us to evaluate community-level functional diversity and detect shifts in functional composition across habitats. Our results reveal clear differentiation among the three habitat types, both in terms of taxonomic composition and functional structure. Chimney habitats were dominated by a few abundant and functionally similar species, mainly associated with greater depths and an intermediate-high trophic level, while rocky areas and especially soft sediments hosted more functionally diverse and taxonomically even assemblages. These findings underscore the ecological heterogeneity of shallow hydrothermal systems and highlight the importance of integrating functional ecology aspects and species-level information to better understand ecosystem functioning and resilience in extreme environments.

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Posters

Working with schoolkids to know, safeguard and increase the plant biodiversity of the coast

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Italy has about 8300 km of coastline, featuring a significant presence of sandy shores. These environments often support a diverse array of species, some of which are currently classified as rare or very rare. Unfortunately, coastal dunes habitats are among the most vulnerable to degradation due to various threats, including excessive tourist development, human activities, and the presence of alien species. The project aims to engage teachers and schoolchildren in the conservation of rare plant species that thrive exclusively in coastal dune ecosystems. New individuals are generated through seed germination and subsequently utilized in actions to reinforce natural populations or in the creation/maintenance of green spaces, in accordance with the principles of Nature-based Solutions (NbS). Two taxa have been selected for the project: *Centaurea aplolepa* subsp. *subciliata* (DC.) Arcang. and *Limonium etruscum* Arrigoni & Rizzotto. Both are endemic to Tuscany and listed in the Red List of the Italian vascular flora as endangered and critically endangered, respectively. The project has been conducted with three first-year classes of Scuola Media "Niccolò Pisano" in Calambrone, Pisa. The importance of conserving biodiversity in situ has been emphasized by the interventions in the classroom, and practical seed cleaning activities were conducted. Guidelines were provided to assist teachers and students in independently carrying out the plant sowing and cultivating activities.

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Posters

Integrating the NBFC BEF monitoring network with old-growth forest sites: assessing the role of age and management on biodiversity and ecosystem function relationships

Giuseppe Brundu[1,2], Andrea Lentini[2], Simone Mereu[1,3], Francesca Angius[1,2], Rafael da Silveira Bueno[4], Emilio Badalamenti[1,4], Francesco Boscutti[1,5], Andrea Brandano[2], Simona Castaldi[8], Tony Chahine[1,2], Annalena Cogoni[7], Francesca Deiana[2], Alessandro Deidda[1,2], Lina Fusaro[1,3], Filippo Gambella[1,2], Carmine Guarino[6], Tommaso La Mantia[1,4], Donato Salvatore La Mela Veca[4], Giovanna Lampreu[1,0], Vanessa Lozano[1,2], Federico Magnani[1,6], Roberto Mannu[2], Michela Marignani[7], Carlo Masnata[10], Francesco Mazzenga[3], Flavio Marzialetti[1,2], Giorgio Matteucci[1,3], Maria Tiziana Alessandra Nuvoli[2], Giovanni Oliveri[4], Maurizio Olivieri[2], Antonello Prigioniero[6], Alberto Sassu[2], Bruno Scanu[2], Maria Teresa Tiloca[2], Marco Vuerich[1,5], Livia Zapponi[3], Luciana Zedda[9], Daniela Zuzolo[6], Donatella Spano[1,2]

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The National Biodiversity Future Center (NBFC) has established a network of 190 sites to assess the relationships between Biodiversity and Ecosystem Function (BEF). The network focuses on seven key forest tree species along a pedo-climatic gradient. A contrast between young and old-growth forests was included in the network to assess BEF relationships within old-growth forests. Eight forest sites, which are potential candidates for the designation as "boschi vetusti" (i.e., old-growth forests, Ministerial Decree 18.11.2021), were included in the network and investigated with a cross-taxon methodology, coupled with a nearby plot of the same forest type but younger. The protocol includes recording DBH, height, occurrence of dendro-micro-habitat within

Posters

Integrating the NBFC BEF monitoring network with old-growth forest sites: assessing the role of age and management on biodiversity and ecosystem function relationships

Giuseppe Brundu[1,2], Andrea Lentini[2], Simone Mereu[1,3], Francesca Angius[1,2], Rafael da Silveira Bueno[4], Emilio Badalamenti[1,4], Francesco Boscutti[1,5], Andrea Brandano[2], Simona Castaldi[8], Tony Chahine[1,2], Annalena Cogoni[7], Francesca Deiana[2], Alessandro Deidda[1,2], Lina Fusaro[1,3], Filippo Gambella[1,2], Carmine Guarino[6], Tommaso La Mantia[1,4], Donato Salvatore La Mela Veca[4], Giovanna Lampreu[1,9], Vanessa Lozano[1,2], Federico Magnani[1,6], Roberto Mannu[2], Michela Marignani[7], Carlo Masnata[10], Francesco Mazzenga[3], Flavio Marzialetti[1,2], Giorgio Matteucci[1,3], Maria Tiziana Alessandra Nuvoli[2], Giovanni Oliveri[4], Maurizio Olivieri[2], Antonello Prigioniero[6], Alberto Sassu[2], Bruno Scanu[2], Maria Teresa Tiloca[2], Marco Vuerich[1,5], Livia Zapponi[3], Luciana Zedda[9], Daniela Zuzolo[6], Donatella Spano[1,2]

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1-hectare plots, for all trees within the plot, assessment of standing and lying deadwood, flora, and presence of seedlings. Structural information will be enriched using cloud points acquired by UAV with LiDAR. The investigation includes the survey of deadwood insects, fungi, lichens and bryophytes. Information on fauna (i.e., vertebrates) is based on historical data kindly provided by local forest authorities (e.g., FoReSTAS in Sardinia). Furthermore, a paired sampling of eDNA is planned in the old-growth forests and in nearby control areas to get information on soil, litter and canopy biodiversity. This case study exemplifies how integrating the NBFC BEF monitoring network with old-growth forest ecosystems can provide valuable insights into biodiversity assessment and forest conservation.

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Posters

How to assess urban Nature-based Solutions (NbS)? Innovative monitoring of arthropods as a key to evaluating their effectiveness

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Urbanization is a major threat to biodiversity, leading to habitat loss and fragmentation. Yet, cities hold the potential as biodiversity hotspots. Recognizing this dual role, the Nature Restoration Law acknowledges the role of urban greening, while suggesting different restoration measures. Among these, increasing Green Infrastructures (GI) in urban environments, such as woodland patches, green roofs, and gardens, is encouraged. Although GI can be a valuable component in Nature-based Solutions (NbS) due to their acknowledged potential to foster biodiversity, shortcomings in proper indications to assess their ecological effectiveness might hinder their action. Since 'Biodiversity increase' figures among the indicators of the NbS effectiveness in urban environments, the urgency for standardizing monitoring frameworks persists. Our project aims to develop an innovative monitoring approach for arthropod biodiversity, integrating DNA-based approaches (i.e., soil eDNA and bulk-sample DNA metabarcoding) with morphological identification and advanced sensor technologies (i.e., computer vision, remote sensing). We present three urban NbS case studies: (i) the BiM raised flowerbeds, (ii) Piazza della Scienza, and (iii) the ForestaMI reforestation project.

Preliminary results showed that in (i), soil-dwelling and above-vegetation arthropod diversity found in two newly built flowerbeds are comparable to or even more diverse than older neighboring flowerbeds, and in (ii), insect abundance increased after a depaving intervention. While these findings support the value of NbS in promoting urban biodiversity, they provide essential information on which environmental variables mostly impact their effectiveness. The obtained data will provide guidelines for the future NbS implementation, as valuable scientific support for urban planners and stakeholders.

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Posters

A survey on Marine Habitat Conservation attitudes of the younger generations in the Strait of Sicily

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Mazara del Vallo is one of the most important fishing hubs in Italy and the Mediterranean, thanks to its strategic location on the Strait of Sicily (Central Mediterranean). In this area, the protection of marine ecosystems and biodiversity is essential to prevent resource depletion, maintain ecological balance, and ensure the economic future of the local community. In this context, an orientation project was launched to engage high school students and assess their understanding of biodiversity and importance of conservation of Mediterranean habitats. A total of 245 students took part in the survey, which was conducted through the submission of a questionnaire. The results revealed gaps in basic biodiversity concepts and limited awareness of the health of Mediterranean marine ecosystems. However, there was a strong recognition (92% of respondents) of the negative impact that biodiversity loss could have on the future of our planet. Additionally, 96% of students identified pollution as the greatest threat to biodiversity, while reducing pollution was considered the most effective action to protect it. These findings highlight the urgent need for educational initiatives to enhance students' foundational knowledge. This can be achieved through seminars, dedicated workshops, and leveraging social media, which 89% of respondents deemed effective in raising youth awareness about environmental issues and conservation. For this reason, we are actively engaging with the local community to raise awareness and deepen knowledge among the younger generations who will shape the world of tomorrow.

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Posters

Diversifying available micro- and nanoplastic reference particles for (eco)toxicological assays—a model study with polylactic acid

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A rapidly expanding body of literature exists which highlights the potential hazards of plastic-based products after they have entered the natural environment. A chief concern, particularly within aquatic environments where hydrolytic and photo-oxidative degradation pathways can coexist, is the formation of smaller fragments of these bulk plastic products. These small fragments of plastic, known as micro- and nanoplastics (MNPs), are documented to be ubiquitous and more bioavailable than their larger macroplastic counterparts. To assess whether these MNPs pose a threat to aquatic fauna, our research group has developed multiple methods for the creation of reference particle systems, including nanoprecipitation or mechanical fragmentation by milling. Milling generates a broad range of MNP sizes (from several hundreds of microns to a few hundred nanometers) which have polydisperse shapes and rough surfaces more likely to be representative of MNPs anticipated to be present in natural environments. However, work with small plastic particles at low concentrations often confounds common analytical techniques. To overcome this, nanoprecipitation can be used to create MNPs which contain labels that aid in their tracking in complex biological systems. In both cases, the resulting MNPs present promising candidates for application in a number of subsequent experiments. Examples of experimental directions include i) direct exposure of aquatic organisms such as coral and zebrafish to assess their interactions and potential toxicity, ii) evaluating the fate of MNPs in simulated digestive fluids, and iii) assessing the influence of more simple systems (e.g., single enzymes) on the properties of the MNPs.

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Posters

PM accumulation as a function of leaf morphology, time and atmospheric parameters in three green wall systems: indoor, outdoor, active living wall

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In the current global context, where urbanization processes are growing air pollution, the improvement of air quality is one of the most important societal challenges, since air pollutants negatively impact human health. It was proved that an effective phytoremediation of air quality can be obtained through the implementation of Nature-based Solutions (NbS), since plants can effectively remove gaseous pollutants and particulate matter (PM) from the atmosphere. Among NbS, Green Walls (GWs) are particularly interesting due to their applicability in both indoor and outdoor environments. To test this hypothesis, we compared the results obtained by three GWs composed by the same species (*Tradescantia zebrina, Nephrolepis exaltata, Monstera deliciosa, Chlorophytum comosum, Hedera helix*) but located outdoor, indoor, and in a closed cabin with a forced ventilation (active living wall). The air PM concentration and chemical characterization were obtained by using a PM sampler, subsequently analysed by microwave induced-plasma optical emission spectroscopy (MP-AES). Then, leaves were sampled from the three GWs after a six-day period and the accumulated PM load was estimated by combin-ing gravimetric and conductimetric approaches. The results provided in-teresting information about the plant's behaviour regarding PM accumula-tion. Some significant differences among species were found, related to micromorphological characters, that deserve a key interest for the future design of effective GWs. In addition, the accumulation efficiency trend resulted comparable in the indoor and the outdoor GWs, while air PM concentration was impacted by the extreme conditions obtained within the closed cabin, revealing a strong dependence on the relative humidity.

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Posters

Digitizing and Mapping Italian Natural History Collections: The Actions of NBFC

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Natural history collections are essential sources for studying the biodiversity of our planet: from them we can gather information about species distribution, biodiversity loss, natural resources useful to the human species, and climate and environmental changes. Italian herbaria and other natural history collections represent an important part of the world natural heritage, a "biodiversity archive" to be protected and enhanced. Among its many activities, the National Biodiversity Future Center is making centuries of biodiversity information stored in Italian museum collections digitally accessible for research and usage by scientists and the public at large. The poster will present the ongoing results and state of the art of NBFC many activities on these topics: 1) massive digitization of eight Italian herbaria at the University of Florence, coordinated by the University of Padua, for a final amount of 4,250,000 specimens and associated metadata; 2) digitizations of other smaller Italian botanical, entomological and zoological collections all over the country; 3) collaborations between NBFC and ITINERIS in order to increase digitizations all over Italy; 4) survey of the Italian natural history collections carried out for NBFC by the Italian Association of Scientific Museums (ANMS); 5) publication of data and dissemination of the results.

Posters

Data-driven bioregionalisation in the Alps

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The Alps are a vast area, and it is challenging to study it in a single work. Moreover, the region has not been subject to a data-driven subdivision. The Alps harbour 105 natural habitats, as classified by the Natura 2000 system, thus ranking them among the most habitat-diverse regions in Europe. To address this knowledge gap, we used the occurrences of natural habitats in the Alps within the 10km x 10km European Reference Grid, to propose a novel statistical habitat-based classification of the Alps employing two clustering methods. We aim to assess whether there are sufficient differences in natural habitat compositions between the subregions of the Alps or whether the area is homogeneous. First, we will perform a basic clustering to create groups that are as homogeneous as possible (with maximum internal homogeneity). Second, we will apply a spatial constraint in order to generate spatially cohesive regions. In both approaches, the abiotic attributes of the grid cells will be characterized, and the primary factors influencing cluster separation will be investigated. It is hypothesised that the altitude and associated climatic variables will be the primary contributors to cluster separation. The results of this study will provide new insights into the classification of the Alps and will be compared with existing classifications of the Alps.

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Posters

Species distribution modeling to support urban biodiversity planning: a study in Turin and Milan (Italy)

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Urban ecosystems can support significant biodiversity, and species distribution models (SDMs) are increasingly used to guide conservation strategies in cities. In this study, we applied Maxent to model the potential distribution of bird species in two major Italian urban areas: Turin and Milan. Presence data were compiled from standardized point counts and citizen science observations, modelling 56 species in Turin and 52 in Milan.

Land-use composition served as the main predictor set, calculated as the percentage cover of land-use classes within moving windows of 100, 250, and 500 meters around each 10×10 m pixel. Species-specific thresholds based on the True Skill Statistic (TSS) were used to derive presence–absence predictions, ensuring balanced accuracy across models. All individual species models performed well, with AUC values exceeding 0.8.

Habitat suitability maps were then aggregated to produce potential species richness maps, providing spatially explicit insights into urban biodiversity distribution. These outputs offer valuable tools for urban planning by identifying biodiversity hotspots and areas in need of ecological restoration or enhancement.

Importantly, the integration of high-resolution environmental data and citizen science enables more equitable and informed decision-making in urban design. By aligning biodiversity data with socioeconomic priorities, planners and policymakers can address both ecological goals and social needs—promoting multifunctional green spaces, improving access to nature, and guiding investment in underserved neighbourhoods.

This study presents a scalable and replicable framework for incorporating biodiversity into data-driven urban planning and supports the integration of ecological and social dimensions in metropolitan landscape management.

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Posters

Design of integrated Nature-Based Solutions for biodiversity enhancement and flood mitigation in the urban riverine ecosystem of the Terzolle River, Florence

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This project aims at designing NbS for biodiversity enhancement, climate adaptation and water retention measures for flood mitigation and improvement of water quality in urban riverine ecosystems and in adjacent degraded floodplain. Urban riverine ecosystems represent natural green and blue corridor connecting urban environment to more natural peri- and extra-urban ecosystems, thus possess great potential for biodiversity enhancement and intrinsic ecological value besides ecosystem services. The project includes several integrated interventions pertaining degraded ecosystem restoration, hydraulic risk reduction, urban fabric improvement and green areas reconnection in the Terzolle catchment, a stream of the minor hydrographic network of the Arno River in Florence. The project is structured into two stages of interventions: the first phase involves limited interventions of river ecosystem restoration within the context of unchanged flood hazard; the second phase involves flood hazard reduction through the construction of two flood mitigation basins and the subsequent massive instream river restoration downstream of the basins. Both implementation phases of the project are integrated with changes of the urban and landscape planning in the areas contiguous to the streams with the aim of regenerating degraded urban areas for the improvement of biodiversity and community health. The academic research group directing the project is composed of hydraulic engineers and technology and landscape architects; the research group cooperates for this project with the Municipality of Florence and the Consorzio di Bonifica del Medio Valdarno in order to also setting up a living lab for the project co-design open to the involvement of further stakeholders.

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Posters

Hyperspectral super-resolution of Sentinel-5P Data

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The World Health Organization recognises air pollution as one of the major environmental health risks. Despite ground monitoring stations provide precise measurements, their coverage is insufficient for large-scale monitoring. Satellites like ESA's Sentinel-5P help address this gap by providing global monitoring of key gaseous air pollutants. However, its high spectral resolution limits spatial resolution to the order of kilometres, restricting local observations.
Since the sensor's nominal resolution is limited by physical constraints, image processing techniques are essential. Given that only one Sentinel-5P image is available per scenario and timestamp, single-image super-resolution (SISR) emerges as the only suitable approach. We thus present S5Net, the first deep-learning-based algorithm designed to super-resolve Sentinel-5P radiance images.
This approach relies on two key contributions. First, we fully formalise the satellite's sensing process, simulating coupled low- and high-resolution images for training. This allows the model to learn the inverse mapping from low-resolution inputs to high-resolution outputs, a critical step given the absence of real high-resolution data. Second, we propose a novel dynamic multi-directional cascade fine-tuning strategy. This technique leverages correlations between consecutive spectral bands, ensuring spectral consistency while reducing computational complexity. Given Sentinel-5P's thousands of channels, this strategy is crucial for promoting both spectral consistency and low complexity.
Experiments on real Sentinel-5P radiance images demonstrate that S5Net achieves a remarkable balance between spectral coherence and spatial resolution improvement. Additionally, S5Net significantly outperforms state-of-the-art (SOTA) approaches making it a powerful tool for enhancing Sentinel-5P's monitoring capabilities, ultimately supporting more detailed and accurate quantitative analysis.

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Posters

Resurveying historical vegetation plots to track community changes in Sardinian coastal dunes: a case study in La Maddalena National Park

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Repeating historical surveys provides a unique opportunity to estimate vegetation and environmental changes over the past decades. Resurveying studies are increasingly used to detect temporal changes in the vegetation of plant communities and are particularly effective in ecosystems where installing permanent plots would be highly demanding, if not technically and/or economically unfeasible.
The objective of this study was to monitor vegetation dynamics in the coastal dune system of La Maddalena National Park (Sardinia, Italy) through historical plot resurveys assessing temporal shifts to evaluate the success of conservation measures.
In 2023 (T1), we revisited six coastal dune sites, resurveying 238 plots distributed across 40 georeferenced transects. The survey replicated the methods used in 2011 (T0).
As a proxy for conservation status, we focused on the dynamics of characteristic dune species versus ruderal species and examined shifts in habitat types (defined according to the 92/43/EEC Habitats Directive) through an alluvial diagram. Additionally, we analyzed potential plant community composition and structure changes using dissimilarity indices based on presence/absence and abundance data.
In T1, we identified 43 species, marking a 30% loss in species richness compared to T0. The Jaccard index indicated medium-high dissimilarity at all sites due to empty plots and high turnover.
These findings suggest that the conservation efforts are insufficient to guarantee the long-term preservation of these coastal dune systems, and new strategies are necessary, mainly focusing on the most vulnerable habitats locally.

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Posters

RootPulseAI: a deep learning tool for automatic image-based Root Health Diagnosis

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Fine roots play a crucial role to plant physiology and have the potential to reveal the performance of forests in both urban and non-urban environments. However, an accurate fine root classification is needed to correctly trace turnover rates, nutrient cycling and possible interactions according to environmental features. In this regard, traditional methods for root classification are time-consuming, require expert knowledge, and are not easily scalable.

In this research work, we present RootPulseAI, a deep learning-based tool designed to automatically classify fine roots as either live or dead through image analysis. Our approach leverages convolutional neural networks (CNNs) and transfer learning techniques, using a pre-trained EfficientNetB0 model fine-tuned on a domain-specific dataset of root scans. To prepare the dataset, a custom extraction algorithm was developed to isolate individual roots from the scanned images and reduce noise, enabling the model to focus on the root meaningful morphological features.

To address class imbalance issues, we applied a combination of dataset balancing, data augmentation, class weighting, and focal loss during training. The model demonstrated promising accuracy and robustness on the test set, suggesting its suitability for real-world applications in both natural and urban environments.

RootPulseAI offers a scalable, efficient, and accurate solution for fine root classification, reducing the need for manual annotation and paving the way for automated root health monitoring systems.

Monitoring their condition, indeed, is essential for assessing plant health and understanding rhizosphere ecosystem dynamics.

Posters

Assessment of the genetic diversity of *Callinectes sapidus* reovirus 1

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The increase in the frequency of epidemics in marine ecosystems is causing significant disruption to marine species. Among the pathogens implicated in these phenomena is *Callinectes sapidus* reovirus 1 (CsRV1), a pathogenic virus with a segmented double-stranded RNA genome, characterized by high mutation rates, short generation times, and segment recombination and reassortment.
We present a phylodynamic reconstruction based on the available genomes and individual segments of CsRV1 in the NCBI virus database. Molecular dating of the complete genome suggests an origin approximately 40 years ago, followed by a rise in genetic variability and an expansion of the viral population around 10 years ago. The estimated evolutionary rates for the 12 segments are similar, around 10^{-4} substitutions per site per year, suggesting that no single segment experiences significantly stronger selective pressure than the others.
In addition, the neutrality test indicates that most segments encoding proteins with highly conserved functions are not under selective pressure. This includes the 9th segment, which encodes VP9, likely representing the viral outer capsid protein. VP9 typically exhibits higher regional and temporal variability.
Continuous monitoring of CsRV1 in geographic areas with the presence of *Callinectes sapidus*—and, more broadly, genetic surveillance of segmented viruses—is crucial due to the risk of genetic reassortment and the potential emergence of more dangerous variants. This risk is heightened by alien species, which can introduce unknown pathogens, potentially threatening endemic species and disrupting ecological balance

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Posters

The role of Nature Reserve Bosco Siro Negri to preserve biodiversity and its medicinal value

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Biodiversity loss is occurring at an alarming rate, representing a threat to human health being natural products a primary source of medicines, supplements, and foods. Conservation efforts have been undertaken, like the institution of Nature Reserves, now protecting over 10% of the land surface. However, a deeper look highlights that nature reserves are rare near industrialized cities, which are areas most affected by biodiversity loss. In this work we investigate the role of Bosco Siro Negri (a Nature Reserve established in 1973, located near the industrial cities of Pavia and Milan) in conserving medicinal species [1]. First of all, the presence of the 113 species growing there was assessed in European Pharmacopoeia, European Medicinal Agency databases, and historical records. Notably, 44 species have been historically used as medicines, despite only a few appearing in official databases.
Next, we built a database of about 1,500 secondary metabolites produced by the species growing in Bosco Siro Negri and implemented this data with their classification, isomeric SMILES, and IUPAC name. The most represented class were flavonoids (38%), followed by organic acids (21%) and terpenoids (12%). The library so obtained was also exploited for virtual screening, exploiting a pharmacophoric model to identify new human tyrosinase inhibitors.
This research emphasizes the crucial role of Nature Reserves like Bosco Siro Negri in preserving medicinal species and facilitating pharmaceutical discoveries. This reserve is a hotspot of pharmaceutically interesting plants and the databases could represent a tool to identify new active metabolites.

[1] Bosco Siro Negri. https://boscosironegri.unipv.it

Posters

Field experiment on the effect of acidification on the seagrass *Cymodocea nodosa* performance

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Future ocean acidification conditions can affect seagrasses, although the consequences of the impact are not easy to predict. This study aimed at evaluating how ocean acidification may affect the seagrass *Cymodocea nodosa* morphology and physiology through a transplant experiment along a natural low pH gradient (Vulcano Island, Italy), estimating the location, manipulation, and origin site effects. *C. nodosa* cuttings bearing five shoots were collected from three control sites, translocated and transplanted in a low pH site. Acidification increased the above and below ground plant size, biomass and pigments and reduced the brown tissue, counteracting the negative effects due to manipulation. The enhancement was stronger in apical shoots dedicated to the plant spread, suggesting a high clonal specialization. This study evidenced an acclimation of morphological and physiological traits of *C. nodosa* in response to future acidification highlighting that climate change effects could also favour the autochthonous seagrass.

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Posters

Recovery of bioactive compounds from *Glycyrrhiza glabra* leaves by Supercritical CO2 Fluid Extraction

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The growing focus on sustainable development across various sectors has heightened interest in natural sources that can both reduce biomass waste and provide high-value bioactive compounds [1]. Calabrian *Glycyrrhiza glabra* is one of the most appreciated licorice varieties worldwide, and its leaves are emerging as a valuable source of bioactive compounds. *Glycyrrhiza glabra* Leaves (GGL) represent a rich source of unusual bioactive compounds, and the most abundant ones are pinocembrin and the prenylated flavanones such as licoflavanone and glabranin [2]. In recent years, Supercritical CO2 Fluid Extraction (SFE-CO2) has gained considerable attention due to its exceptional efficiency in isolating valuable compounds from plant materials [1]. In this study, SFE-CO2 was selected to recover non-polar bioactive compounds from GGL and to obtain safe, high-quality extracts. Main parameters such as pressure, temperature and dynamic extraction time were optimized in order to improve the extraction efficiency of SFE technique, by using a randomized Box-Behnken design. The optimal operating conditions determined from the response surface methodology were 40°, 400 bar and 90 minutes of dynamic time, with a desirability score of 97%. The metabolite profiles of GGL extracts obtained under these conditions showed the absence of flavanol glycosides of the inner leaf. This result highlights the ability of SFE to selectively extract key metabolites with high purity, minimizing the co-extraction of non-target compounds.

Reference

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Posters

Temporal and spatial vessel density changes at Mediterranean scale

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Maritime traffic, a key component of the global economy, is influenced by socio-political, ecological, and climatic factors. Over the past century, seaborne trade has increased, intensifying pressure on ocean and coastal environments. Vessel density can be studied using ship-tracking data from AIS technology, recently available through open-source databases. Among these, the EMOD-NET database, provided by the European Commission, offers environmental and human activity data across European marine areas. Here, we used EMOD-NET vessel density data to investigate monthly and yearly changes from 2017 to 2023 comparing data between Mediterranean subareas, bathymetric classes and socio-cultural aspects such as COVID19 pandemic effects and Russia–Ukraine conflict. Results indicate that average vessel density in the Mediterranean Sea can reach 10 hours/m², with peaks over 50 hours/m² near major ports. Fishing vessels show the highest density in the Adriatic Sea and Sicilian Channel at depths under 100 meters, while cargo vessels are most concentrated in the Gibraltar EEZ and areas GSA01, GSA16, and GSA15. Temporal trends reveal a summer peak for both vessel types, with fishing activity declining significantly from 2020, likely due to COVID-19 restrictions, and cargo activity decreasing in 2020 but rising from May 2022, possibly linked to the Russia–Ukraine conflict. Preliminary results highlight key areas of heavy use and their potential environmental impacts, as well as the broader socio-economic implications. Future research will expand spatial and temporal coverage by integrating additional databases, exploring fishing gear types in the Mediterranean, and analysing their relationship with small pelagic species across the region.

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Posters

Salivary miRNAs as non-invasive biomarkers of aging and exposome impact: insights from the One-Health Aging Project

Chiara Ceriani[1,2], Maddalena Maria Bolognesi[1,2], Tecla Aramini[1], Teresa Sassetti[1], Gloria Rita Bertoli[1,2], Daniela Gaglio[1,2], Martina Caramenti[1,2], Danilo Porro[3], Antonio Cerasa[1,2], Francesca Gallivanone[1,2], Michele Caccia[1,2]

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Aging is a multifactorial process influenced by genetic, lifestyle, and environmental factors. Understanding its biological heterogeneity is essential to promote healthy longevity and reduce age-related diseases' burden.

The project "Integrated innovative technologies for the development of a One-Health approach in the elderly population (One-Health Aging)" aims to identify non-invasive biomarkers capable of reflecting and predicting the impact of the exposome on health status across the lifespan.

Circulating microRNAs (miRNAs) have emerged as promising candidates for this purpose. Owing to their role in post-transcriptional gene regulation and stability in accessible biological fluids, miRNAs represent reliable indicators of both physiological and pathological states.

Using RT-qPCR, we quantified the salivary expression of miRNAs associated with inflammation and senescence in a cohort of 124 healthy individuals aged over 40. Preliminary results revealed no sex-based differences in miRNA expression. However, age-stratified analysis showed a significant downregulation of neurodegeneration-associated miR-132 and inflammaging-related miR-146a and miR-155 in participants over 60.

These findings support the feasibility of saliva for miRNA profiling and suggest age 60 as a critical threshold for aging-linked molecular changes. The absence of sex bias strengthens the translational potential of these miRNAs as biomarkers, enabling ongoing investigation of exposomic correlations, which may reveal modifiable factors (diet, physical activity, smoking, perceived stress, pollution).

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Future efforts will integrate miRNA data with additional non-invasive aging descriptors and validate associations with physical and cognitive performance. This research supports the development of personalized strategies to promote healthspan, monitoring the aging process through early biomarker detection and targeted lifestyle interventions.

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Posters

Tense with biological invasion? TESO, the Working Group on alien species within NBFC

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Biological invasions inflict severe impacts on biodiversity, ecosystems, and human health. To respond to this significant challenge, over 40 research groups affiliated with the various NBFC spokes have associated in TESO (Tavolo per le specie ESOtiche), a working group focused on the study of biological invasions across different realms and disciplines. TESO also include researchers and technicians from parks and companies benefiting from the NBFC call for Italian Protected Areas. TESO brings together the wide spectrum of activities aimed at investigate biological invasions that fall under five main research lines: i) Macroecology, with the analysis of ecological patterns at large/medium scales; ii) Distribution Mapping, collecting distribution data to fill knowledge gaps; iii) Monitoring System Development, with the design of methodologies for systematic and repeated surveys of species and ecological states; iv) Economic Use, focusing on the utilization and economic valorization of exotic species; v) Impacts, with the analysis of negative effects of alien species.
The main goal of TESO is to create a positive societal impact within NBFC's Biodiversity Gateway by sharing resources with stakeholders, as well as citizens; by developing operational guidelines to prevent and manage the introduction and spread of exotic species; by producing overarching scientific papers among TESO different researchers; by aligning existing databases and harmonizing research groups' methodologies, and by establishing a platform to provide information on exotic organisms and simple yet reliable simulation tools to assess the risk of invasive species spread in different contexts.

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Posters

Digital solutions for the italian biodiversity community

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Supporting Italy's Biodiversity research community, the NBFC Digital Platform provides streamlined access to specialized tools, organized across four macroareas tailored to diverse scientific needs. It particularly enhances workflows in species monitoring, genetic data analysis, ecosystem modeling, and conservation planning. The platform architecture is based on containerized microservices and hosted by CINECA, ensuring scalability, reliability, and efficient resource management. In addition to the macroareas, it features an InterActive Computing (IAC) environment, which enables expert users to leverage high-performance computing (HPC) clusters for advanced analyses.
Registered users can assume different roles and share files both individually and within groups, fostering collaboration. Overall, the Platform represents a significant step toward integrating computational resources, specialized tools, and collaborative workflows to advance biodiversity research across Italian institutions.

Posters

Fine-scale habitat features drive taxonomic diversity and ecosystem service provision in urban bird assemblages

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Urban green spaces are essential for sustaining biodiversity and the ecosystem services that support human well-being in cities. However, fine-scale habitat features shaping these dynamics remain poorly understood. Here, we analyze the relationships between habitat structure and human-built infrastructures with bird-mediated ecosystem services—including taxonomic diversity, cultural values (e.g., attractiveness, aesthetic appeal), and regulating functions (e.g., seed dispersal, pest control)—across six Italian cities. We found that grass cover and water bodies were key predictors of avian diversity and ecosystem service provision. Grass-rich areas supported more diverse bird communities, while aquatic features not only enhanced species richness, but also strengthened critical regulating services. Conversely, species richness and cultural services were lower in highly impervious areas, highlighting the negative impact of extensive built surfaces on urban biodiversity. Cultural service hotspots were associated with the presence of informational signage, suggesting a societal preference for biodiverse spaces. Additionally, intermediate canopy and shrub heights maximized taxonomic diversity, emphasizing the role of structural heterogeneity in urban planning. Our results underscore the need to prioritize vegetation diversity and integrate blue-green infrastructure in urban landscapes to foster resilient bird communities and multifunctional ecosystems.

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Posters

The Social Construction of Urban Biodiversity: A New ‘Right to Nature’ in the Green City?

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Biodiversity has recently emerged as a key issue for the urban governance of the ‘smart city’ (Nilon et al. 2017). While traditionally confined within the field of environmental conservation, and mainly conceived as a property of wilderness, it is now becoming part of a wider debate investing the green regeneration of urban voids. What are the characteristics of the new urban politics of biodiversity? How is the problem of nature politicized by the main relevant collective actors within the ‘sustainable’ smart city? How does it become a public good subjected to conflicts and aspirations to participation that invest both the scientific and political field?
The presentation compares evidences from in-depth cases of citizens participation and conflicts in the metropolitan area of Milan. It pinpoints the key aspects of the politics of urban biodiversity and link them to the broader attempts to 'democratize the green city'.
The proposal aims to speak to the axes dedicated to the territorial stratification of inequalities and the new distribution of resources among neighborhoods and classes. On this points, urban biodiversity can acquire very diverse meanings: on the one hand a form of green gentrification connected to new forms of growth triggering new inequalities (Gould and Lewis, 2017), on the other hands a form of ‘right to nature’ linked to environmental justice and common good (Gilbert and Phillips, 2003).

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Posters

Tree-related microhabitats and deadwood as biodiversity indicators across urban and peri-urban parks in Italy

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Tree-related microhabitats (TreMs), along with deadwood, represent crucial habitat components for several forest-dwelling species, even rare and endangered ones. Moreover, they can serve the purpose of ecological indicators for species abundance and richness estimation. In this study, ground-based observations gathered in 180 sample plots (13m radius) were implemented to analyze the presence of TreMs and deadwood in urban areas. The plots, located in 12 parks of three Italian cities – Florence, Rome, and Campobasso – followed an urban to peri-urban gradient. Results show how, considering the studied areas, Florence hosts the largest number of sampled TreMs (26319), most of them located in Giardino di Boboli (20227). Among the 12 urban parks, the most observed TreMs were the "insect galleries and bore holes" and "sap and resin runs" (9086 observations each), while "cankers" and "myxomycetes" were the least sampled (fewer than 20 observations each). Rome, on the other hand, has the largest share of deadwood. The majority is found in the Riserva Naturale di Decima Malafede (399.34 m^3), the most distant site from the city center, followed by Villa Ada with 300.45 m^3. Across all deadwood types sampled in the 12 urban parks, coarse woody debris was the most abundant in terms of volume, with 718.85 m3, especially when compared to dead downed trees (7.42 m3) and standing dead trees (15.88 m3). Thus, deadwood and TreMs' retention can be pivotal in constituting clear tools for biodiversity conservation efforts in urban areas.

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Posters

Integrated management of urban soils for carbon retention, soil health and biodiversity

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Urban soils, though typically altered by human activity, play a key role in the carbon (C) cycle by contributing to both sequestration and emissions. Soil C content is regulated by a dynamic balance between fixation processes (photosynthesis and chemosynthesis) and release processes (respiration and decomposition), influenced by various factors such as microorganisms, vegetation, soil communities, resource availability, and topography. Since atmospheric CO_2 levels are directly linked to global warming, storing C in soils, including the urban ones, as organic matter or more stable compounds can help mitigate climate change. Sustainable management of urban soils can enhance C sequestration and promote resilience in urban environments. Within the NBFC project, experimental research is ongoing in two urban areas of Campania region (Avellino and Fisciano-Salerno) to assess the effects of sustainable versus conventional soil management practices. These include repeated applications of organic (vermicompost and micronized biochar, singularly added, or as a combination) and mineral (urea) fertilizers, alongside long-term monitoring of biological and chemical-structural soil indicators, focusing on C storage and biodiversity. Preliminary findings over two years suggest that mineral fertilizers lead to high CO_2 emissions, high microbial activity but low biodiversity, and reduced soil stability. Vermicompost alone improves both chemical soil properties and microbial diversity, while biochar alone mainly enhances chemical and physical soil stability. The combined use of vermicompost and biochar yields the most promising results: lower microbial respiration, higher biodiversity, improved soil stability—making it a valuable strategy for sustainable urban green space management and long-term C retention.

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Posters

Branching out: forest community composition and assembly with AI and EO, a scalable approach

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Accurate spatial distribution of forest species composition is crucial for biodiversity monitoring, management, and protection. Combining this with field structural metrics (e.g., basal area, species co-occurrences, canopy height) improves our understanding of ecosystem functions and their relationship with biodiversity. A geospatial approach is particularly effective for analyzing species composition and interactions within a community-based framework. Advancements in high-resolution remote sensing and AI have improved our ability to model forest ecosystems, especially when combined. In this study, we use EO data from Sentinel-2: NDVI metrics (maximum, minimum, median, near-extreme percentiles, and standard deviation) as indicators of canopy density, health, and irregularity; Sentinel-2-derived canopy height to assess forest structure and vertical stratification. These metrics describe vegetation phenology and heterogeneity, supporting more accurate assessments of forest composition and structure. Field data from forest inventory datasets are used to calibrate and validate models for species composition, basal area, and other key structural parameters. In parallel, mechanistic species distribution models (SDMs) and community assembly (JSDMs) models offer insights into environmental filtering and competitive dynamics. We present a hybrid geospatial approach that combines JSDMs (i.e., HMSC) with AI algorithms to map forest species composition, relative abundance, and basal area across Italy. This framework integrates Sentinel-2 features with pedological and bioclimatic variables, functional traits, CWM, Functional Dispersion Index, and phylogenetic distances, capturing complex species-environment relationships. To further improve interpretability, we apply association rule learning, uncovering ecological patterns often missed by traditional methods. Our approach advances biodiversity dynamics understanding and is transferable to broader ecological challenges.

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Posters

Fatty acid profile of lipids from microalgae grown on media with hydrolysed agro-food biowaste

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The growing demand for natural products for the nutraceutical, pharmaceutical and cosmetic industries has led to investigate micro and macroalgae as a source of bioactive compounds of interest, including carotenoids, polyphenols and fatty acids. Moreover, as microalgae often grow in mixotrophic conditions, enriching the culture media with a carbon source coming from biowaste, is an interesting perspective to develop sustainable processes.
This presentation will concern the study of the fatty acid profiles obtained from the microalgae Chlamydomonas reinhardtii (CC-503 and CC-5163).
The microalgae were grown in mixotrophic conditions, employing TAP media containing variable percentages (5% and 15%) of hydrothermally hydrolysed biowaste coming from the agri-food industry or the environment such as orange peels, hemp or the algae Cladophora glomerata.
The microalgae biomass was harvested after 10 days from inoculum by centrifugation and washed with water to eliminate media residues and finally freeze-dried.
The fatty acids fractions were obtained by rupture and extraction of the microalgae biomasses (2-3 mgs) in two-steps carried out with 0.5 mL 0.035 M KOH in methanol (keeping the sample in these conditions overnight) and sonication for 5 min (step 1), then 0.1 ml of 2% H_2SO_4 in methanol is added (Step 2). Next, the sample was extracted with 0.6 mL of petroleum ether and analysed by gas chromatography (GC-FID).
The microalgae growth and the fatty acids profiles were influenced by the addition of the biowaste hydrolysate, which significantly increased the percentage of unsaturated fatty acids, C16:2, C16:3, C18:2 and C18:3.

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Posters

Italian mayflies (Insecta: Ephemeroptera): discovering freshwater hidden biodiversity

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Taxonomic knowledge of mayflies (Insecta: Ephemeroptera) is a key to understanding freshwater biodiversity, and species-level identification is essential to study communities in depth, detect global changes and predict their impacts. In Italy, Ephemeroptera have only been intensively studied during two main periods in the 20th century: the 1950s and the 1980s–1990s. Thanks to the NBFC project, a new active phase has recently begun. An updated checklist of Italian Ephemeroptera, completed in 2025 (Buffagni & Belfiore), reports 106 species currently believed to occur in Italy, based solely on traditional morphological methods. It also describes interesting and controversial cases (i.e. species inquirenda) and emphasises the high percentage of endemic species, about 27% of the total. This pattern is confirmed by parallel analysis of BINs, the Barcode Index Numbers on the BOLD platform, which algorithmically groups COI barcode sequences into clusters, and BINs are examined by Ephemeroptera genus in order to assess the degree of BIN sharing or exclusivity among European countries. Despite uneven data across countries, the results show that Central Europe has a much higher total (and shared) number of BINs present than other areas, but the Central Mediterranean (i.e. geographical Italy) and the Eastern European area have high values of exclusive BINs, with few BINs overall. These studies confirm the remarkable richness of Italian biodiversity and highlight the growing importance of taxonomic research in providing a clearer understanding of the status of Italian Ephemeroptera, including their role within the broader European context.

Posters

Monitoring and enhancing biodiversity through palynology and archaeobotany: insights from Italian and Mediterranean ecosystems

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The research team of the Laboratory of Palynology and Palaeobotany (LPP) of Modena works within Spoke 3 of the National Biodiversity Future Center (NBFC), supporting awareness of plant biodiversity and offering insights into environmental sustainability and ecological dynamics across millennia.

LPP's activities follow two complementary approaches. The first focuses on long-term plant diversity dynamics through research on micro (pollen, NPPs, and charcoals) and macro (seeds/fruits) remains. Archaeological and natural sites—such as lake and high-altitude areas—are selected for core sampling. Through chemical treatments and microscopical analyses, comprehensive floristic lists of the past are obtained for each site. Pollen data help track endangered, native, and invasive species, and support the reconstruction of past environments influenced by fire regimes, climate variability, and human impacts. All data are integrated into the BRAIN (Botanical Records of Archaeobotany Italian Network) database. The second approach involves the review, expansion, and digitisation of archaeobotanical plant collections. This includes updating reference materials, acquiring new records from Italian and international institutions, and refining specimen identification. A coherent and unified data entry system for pollen and seeds/fruits within BRAIN is under study.

Selected case studies from LPP's ongoing research will be presented.

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Posters

UrBio – Citizen Scientists for Monitoring Large-Scale Urban Biodiversity

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Urban environments host a surprising variety of animal species, including birds and mammals that have adapted to anthropogenic habitats, giving rise to distinctive synanthropic communities. Yet, the expansion and intensification of cities can deeply alter local ecosystems, triggering the decline of sensitive species while facilitating the spread of others that are sometimes viewed as problematic. Large-scale biodiversity monitoring is key to addressing these challenges, but understanding the mechanisms behind impacts of urbanization remains a major issue, partly due to the limited scope of traditional monitoring approaches.

The UrBio project, funded by the NextGeneration EU programs (NBFC and MUSA), addresses this gap through large-scale, citizen science-based monitoring of urban birds in Italy. Since its launch, 1,101 volunteers have submitted 272,675 records from 1,102 municipalities via Ornitho.it, documenting 390 species and subspecies. These data offer a valuable resource for investigating how urban bird communities are distributed across different city contexts and how their presence relates to ecological and anthropogenic variables, such as green cover, habitat fragmentation or human density.

By analyzing biodiversity patterns at both local and national scales, the project aims to identify key environmental drivers and track population trends over time. This knowledge will help define conservation priorities and inform urban planning that integrates biodiversity needs. UrBio highlights the potential of citizen science to generate high-resolution data, bridge research and public engagement, and support evidence-based strategies for urban ecosystem sustainability.

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Posters

Alteration of behaviour and gene expression in the Mediterranean green crab (*Carcinus aestuarii*) under intra- and interspecific competition conditions

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Biological invasions are among the main drivers of biodiversity loss, and they strongly impact coastal and estuarine habitats. The settling of invasive species is known to impact the functioning of the invaded ecosystem and, by introducing a novel competitor, disrupt the biotic relationships with native species. On the other hand, both native and invasive species may adapt their behavioural patterns to the competitor's presence to maximise their fitness and survivorship.
We investigated how the behaviour of the native Mediterranean green crab (*Carcinus aestuarii*) can be altered by intra-specific competition and by the presence of the invasive Atlantic blue crab (*Callinectes sapidus*). Both species show a high tolerance to environmental fluctuations, and compete for the same resources in the estuarine environment.
The behaviour of the two species was videorecorded in mesocosms under control, intra- and inter-specific competitive conditions. The time focal crabs spent in various activities was recorded and analysed. To simulate competitive interactions, crabs were placed in aquaria divided by a perforated transparent screen to allow for water flow between the two chambers. Thus, individuals were able to perceive each other without direct interactions. Tissue samples from a subset of treated animals were collected to investigate the effect of competition on gene expression through RNA sequencing.
Video analyses show that intraspecific and interspecific competition conditions influence the behaviour of green crabs, in both sexes and during the day and night. In addition, the presence of blue crabs alters the behavioural patterns of the native species more significantly, especially in females.

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Posters

Looking for new plant species on metalliferous soils

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Trace metals are elements with a density greater than 5 g/cm³. While a few are essential in tiny amounts for living organisms, most become toxic even at low levels. Human activities, like traffic and industry, are increasing trace metal levels in the environment posing a serious threat to biodiversity and public health.

Some soils are naturally rich in heavy metals due to their geological origins. These metalliferous soils create challenging conditions for most life forms, yet a unique group of plants, called metallophytes, has adapted to thrive in these environments.

Our research focuses on the biodiversity of these specialized plants, particularly “hyperaccumulators”, rare species capable of extracting metals from the soil and accumulate them in their shoots. This trait not only offers ecological advantages to the plant but also opens possibilities for phytoremediation of contaminated lands.

Thanks to NBFC-funded expeditions across the serpentine landscapes of the Balkans, we discovered a new hyperaccumulator species: *Odontarrhena vourinensis*, identified on Mt. Vourinos (Greece). Laboratory studies confirmed its exceptional ability to accumulate over 10,000 µg/g of nickel in its leaves, making it a promising candidate for nickel soil remediation.

Our work continues, deepening our understanding of plant adaptation and biodiversity on metalliferous soils.

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Posters

Materials Science in Coral Protection Actions

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Coral reefs are one of the most biodiverse ecosystems in the world and provide support for food, medicine, and tourism to the local population. This fascinating ecosystem is threatened by decline due to climate change and human-related activity. It has been estimated that by the end of 2050, 50% of the reefs will be damaged. In addition, massive events of coral disease outbreaks and coral bleaching are becoming more frequent every year, accelerating the rate of loss of these ecosystems. Several efforts have been made in the direction of healing, restoring, and rescuing the reefs, but most of these approaches are not 100% eco-friendly in terms of employed materials, and so far, they have been unsuccessful in arresting the progression of this ecological drama. In this regard, innovative and advanced strategies combining knowledge in materials science, pharmaceutics, marine sciences, and ecology have been designed to be applied in three different research macro areas. Specifically, new functional bio-based and biodegradable materials for facing coral disease and coral bleaching, and enhancing coral out-planting and growth yield will be presented with the hope of giving a chance of survival for this millennial underwater paradise.

Posters

An ecological model to study how the architecture of interaction networks link to species rarity and temporal persistence in plant-pollinator communities

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The functioning of plant-pollinator mutualistic networks is crucial for ecosystem services and biodiversity maintenance. These communities are, however, heavily affected by both global and local scale environmental and human-induced changes. Wild pollinators' abundances and richness are thus declining at an alarming rate. We propose an ecological, process-based mathematical model describing the dynamics of pollinators and plants, properly mediated by reward resources. Our model explicitly accounts for the major interactions of both facilitative and competitive nature that occur both within and between the two guilds. In this study, we contrast the model's outcomes with empirical evidence from large datasets to investigate how the architecture of the interaction networks relates to local extinction of generalist vs specialist pollinator species, thus ultimately with the biodiversity of the community. As community dynamics emerge from the interplay between species traits and the structure of the plants-pollinators network, this study shows how the model can be used as a tool to investigate important ecological mechanisms that link the species position within the network and its temporal persistence or occurrence rarity at the landscape level.

In the context of urbanization-induced disturbances, this translates into understanding how habitat fragmentation and altered environmental conditions could impact community composition and the resulting (thus observed) spatiotemporal patterns.

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Posters

Understanding vascular species diversity in floodplain poplar tands: an integrated ecological and functional approach

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Restoring biodiversity is pivotal to enhance natural ecological processes in floodplain areas, especially in riparian ecosystems, characterised by an intensive human transformation. Improving the functionality of these ecosystems through new plantations is an effective nature-based solutions, also in a global change perspective. Poplar (*Populus sp.*) plantations have great potential for fast and high biomass yield, preventing soil erosion, protecting soil water and providing habitats for many plants. However, the impact of poplar plantations and their management on biodiversity have been little studied. Aims of this study were to investigate the impact of different management degree on vascular flora diversity (native and exotic) and to define the main drivers (stand structure, soil properties) of vascular species diversity. In 3 sites along the Po River (N-Italy), an integrated survey protocol has been applied for the data collection of vascular species diversity, stand structure, soil properties in three stand types, with different management level (cultivated, semi-natural and natural). Semi-natural stands showed the highest number of native species and limited invasiveness as well as a more efficient soil nitrogen cycle than natural and cultivated ones. The total soil Ca and microbial nitrogen limitation resulted the main drivers of species diversity in the studied poplar stands.

Posters

Understanding vascular species diversity in floodplain poplar tands: an integrated ecological and functional approach

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These results advanced knowledge of the ecological characteristics of riparian woodlands and provide support for shaping management practices to support diversity in poplar plantations.

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Posters

Restoration ecology and urban biodiversity: the SERRA Project approach

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The SERRA project aims to support urban ecological transition through the selection, production, and use of native herbaceous species from the Italian Mediterranean flora, suitable for the restoration of marginal and degraded urban areas. Its main goal is the creation of seed mixes tailored for restoration ecology interventions in environments affected by biotic and abiotic stressors, such as heat islands, high humidity, and soil pollution. Selected species are chosen not only for their adaptability but also for their potential to enhance urban biodiversity, support pollinators, tolerate contaminants like heavy metals, and activate key regulatory ecosystem services.
SERRA directly contributes to the objectives of Spoke 5 of the National Biodiversity Future Center (NBFC), promoting innovative, integrated green solutions for sustainable urban regeneration.
The project follows an integrated research and experimental development path, including several phases: selection of Mediterranean species, assessment of their tolerance to contaminants, analysis of interactions with pollinators, and studies on plant phenology and development in urban contexts. Expected outcomes include species lists and seed mixes for ecological urban interventions, with a direct impact on local plant nursery supply chains.
Following species selection, the project has entered its operational phase. In agreement with the Municipality of Cagliari, sites have been identified for planting the selected species, putting into practice the sustainable regeneration strategies developed.

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Posters

Assessing anthropogenic and climatic impacts on benthic communities, with a particular focus on erect calcified organisms

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This research investigated how anthropogenic disturbances and global warming can influence marine benthic communities, specifically fragile erect calcified organisms, such as structuring anthozoans. One study aimed at quantifying the effects of diving tourism on *Leptopsammia pruvoti* (Lacaze-Duthiers, 1897) and *Corallium rubrum* (Linnaeus, 1758) inhabiting the Colombara Cave in the Portofino Marine Protected Area, one of the most frequented MPA of the Mediterranean Sea. These species are bioindicators of diving-related vulnerability. Pre-diving and post-diving season samplings were performed, including photographic frames and sediment collection. Data analysis showed no significant difference between the two periods, possibly due to reduced tourist activity in the summer of 2024, with 1500 dives recorded compared to 3500 in 2016. Biogenic detritus- rolling down was attributed to natural detachment due to storms occurring on the days before samplings. The project also aimed at monitoring the health of seventeen *Cladocora caespitosa* (Linnaeus, 1758) colonies to assess the potential effects of late-summer heatwaves known to cause mass mortalities. Two 10 m-long transects, located at 10 m and 15 m, hosting 8 and 9 colonies, respectively, were carried out monthly from June to October 2024 in the Portofino MPA, and all colonies were photographed with a scale. The analysis showed no evidence of bleaching during the summer of 2024, but further observations will be carried out in 2025 for interannual comparisons. These studies are crucial for quantifying the effects of human activity on benthic communities and assessing the potential recovery of the target populations.

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Posters

Stability and chaos: how the microbial loop affects the dynamics of the entire trophic network

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A significant debate in the literature concerns the relationship between stability and complexity in ecological networks. Understanding the dynamic behavior of real-world complex networks is crucial for assessing their predictability, improving ecosystem management and preserving biodiversity, especially in the context of climate change.
In this study, we aim to investigate how the microbial loop influences the stability of the entire trophic network. The microbial loop is a key process at the base of this system, where bacteria recycle detritus from higher trophic levels into nutrients, which are subsequently available for the growth of primary producers.
To do this, we incorporate the microbial loop into a trophic network model, which includes one to three primary producers, one or two consumers, and primary, secondary, and tertiary predators (Fussmann, 2002). The microbial loop and the resulting mass balance from nutrient recycling increase the complexity of the model and introduce real-world constraints. We perform numerical simulations to investigate the network's stability, periodicity, and chaotic behavior, exploring different degrees of complexity by (i) studying several configurations of the trophic network and (ii) varying the high-dimensional parameter space.
The preliminary results show how the microbial loop significantly affects the dynamic behavior of the network, determining chaotic, oscillatory, and stable zones.
This study highlights how processes at the lower levels of the network can impact the overall stability, with implications for its predictability, resilience, and preservation of biodiversity.

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Posters

Safeguarding and exploiting biodiversity: integrative metabolic and omics approaches to understand and improve plant resilience

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Climate change is driving significant shifts in plant distribution, especially due to invasive species like *Atropa belladonna* L. spreading into new areas, threatening biodiversity and agriculture (Rai et al.2020). Native to Europe, North Africa, and Western Asia, this toxin-producing plant is increasingly found alongside staple crops, posing risks to both ecology and food safety (Casado et al.2024; Pellegrini et al. 2021). *A. belladonna*, a member of the Solanaceae family, produces tropane alkaloids (TAs), secondary defensive metabolites against herbivores (Casado et al.2024). The spread of *A. belladonna* beyond its native range has highlighted its invasive nature and its potential food crops contaminant. While TAs have both beneficial and harmful effects on human health, their role in abiotic stress tolerance remains poorly understood. This study aims to investigate the overall metabolic response of *A. belladonna* under saline stress, focusing on TAs biosynthesis and other biochemical, hormonal, and phenotypic changes that may contribute to its invasive and climate-tolerant behavior. A greenhouse experiment was conducted by exposing *A. belladonna* plants to saline irrigation (0, 80, and 150 mM NaCl) for 21 days. Transcriptional analysis and biochemical tests will be used to picture a broad overview of *A. belladonna* stress responses. By identifying genes involved in TAs production and stress signaling, this research could lead to the discovery of genetic traits for resilience, potentially transferable to stress-susceptible Solanaceae food crops like potatoes. This could enhance crop resistance to environmental stress, supporting agriculture and food safety under climate change.

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Posters

Bryophytic biodiversity, governance and environmental management and planning. An integrated model for monitoring the Protected Coastal Areas of the PNCVD

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In a context of increasing attention to sustainability and territorial resilience, the use of natural bioindicators to monitor the health of ecosystems is an increasingly relevant practice. Bryophytes, non-vascular plants among the oldest plant forms, are characterised by their sensitivity to environmental conditions, thus becoming valuable partners in the study of anthropogenic and climatic impacts on the territory. The proposed approach has an interdisciplinary character between environmental science and territorial policy, with the aim of investigating the potential of bryophytes as a decision-support tool in the sustainable management of the coastal areas of the Cilento, Vallo di Diano and Alburni National Park. In particular, 115 taxa were identified, of which 44 were new reports for the area examined, showing the area's high ecological value. The analysis, conducted by measuring ecological indicators and comparing the national literature, revealed a particularly rich biodiversity and an above-average conservation status for similar ecosystems. These results show how the adoption of biological indicators can offer a solid cognitive basis for orienting territorial policies towards more balanced and far-sighted development models. In areas as vulnerable and at the same time dynamic as the Cilento Par Cilento, Vallo di Diano and Alburni National Park, integrating scientific data into decision-making processes is not only desirable, but strategic: it means building resilience, enhancing the natural heritage and giving strength to a vision of the territory as a common good to be read, understood and protected.

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Posters

Valorizing plant biodiversity: enhancing bakery products with underutilized plant extracts for nutritional and sensory innovation

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In recent years, there has been growing interest in valorizing plant biodiversity by incorporating underutilized plant parts into food products, enhancing both their nutritional and sensory properties. This research explores the development of bakery products fortified with plant extracts, focusing on increasing the nutritional value while maintaining desirable technological and sensory characteristics. We have created two innovative products: wheat bread and ice cream cones, enriched with plant-based ingredients. The first study evaluated the enrichment of wheat bread with *Matricaria chamomilla* extract [1], highlighting its potential to improve antioxidant activity, protein, fiber, and sensory properties, while maintaining a similar sensory profile to traditional bread. The second study optimized a gluten-free ice cream cone formulation using carrot powder and Ziziphus syrup, demonstrating improvements in antioxidant activity, nutritional content, and sensory appeal. Building on these results, we are now developing a new line of bakery products, incorporating extracts from artichoke by-products (capolino and bracts), which are rich in bioactive compounds. The goal is to use these plant-based by-products to create functional and innovative sweet baked goods. This approach not only enhances the nutritional profile and sensory quality of bakery products but also contributes to the sustainable utilization of plant biodiversity. By integrating lesser-known parts of plants, we can create novel products that are both functional and environmentally responsible, thus promoting a circular food economy.

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Posters

Valorizing plant biodiversity: enhancing bakery products with underutilized plant extracts for nutritional and sensory innovation

Maria D’Elia[1,2,3], Khawla Kerbab[4], Fairouze Djeghim[5], Valentina Santoro[12], Rita Celano[12], Anna Lisa Piccinelli[1,2], Mariateresa Russo[6], Rosa Di Sanzo[6], Sonia Carabetta[6], Luca Rastrelli[1,2]

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Posters

Urban socio-ecologies as multidimensional relationships to be understood. A pilot interdisciplinary survey

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Some scholars have underlined the role of biologists as conservators of the human experience of the ecosystems and biodiversity as a whole, rather than conservators of specific biological communities. Indeed, in their opinion the current socio-ecological crisis stems from the separation of the ecological and social dimensions in an increasing urbanised world. Consequently, the key factor of effective ecosystems restoration policies in these areas lies in the ability to activate interest and mobilise caring actions by citizens.

The multidimensional feature of socio-ecological relationships have been deeply analysed by scholars with heterogeneous disciplinary backgrounds. The existence of different values, which define human attitudes towards the ecosystems and biodiversity, have been put at the core of the environmental governance strategies of prominent international bodies such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). The term value often relates to utilitarian or instrumental uses of environmental resources. However, human behaviour is determined by other and equally important types of values. Intrinsic value, relations values and bequests values play a pivotal role in this regard. Additionally, aesthetic value can affect individual and collective decisions especially within urban settings.

Given this premises, the pilot interdisciplinary survey which will be conducted starting from May 2025 aims to analyse the attitudes of different social groups towards ecosystems and biodiversity protection and restoration. The final goal of the research conducted is to collect data which could sustain effective science-based environmental policies in urban and peri-urban areas at different geographical scales.

Posters

Wild bee-friendly management of peri-urban riparian areas (Hymenoptera: Apoidea: Anthophila)

Oana Catalina Moldoveanu[1], Martino Maggioni[1,2,3], Daniele Vergari[4], Francesca Romana Dani[1,3]

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The European Red List of Bees (Nieto et al., 2014), published more than 10 years ago, reported a decreasing trend in the populations of many bee species. Since then, species checklists and red lists have been elaborated by some European Countries, and efforts have been made to update the whole European species list (Ghisbain et al., 2023; Reverté et al., 2023). Although the 2014 red list assigned a conservation status to less than half of the species, due to the lack of data for the others, the concerning trend set the basis for measures to support wild bees and other pollinators both within the Common Agricultural Policies (CAP) and the European Nature Restoration Law. Increasing trophic resources by sowing flower strips in arable lands or urban and periurban contexts is one of the main actions, and some National CAPs have included a specific eco-scheme for pollinators to support farmers adopting this practice. However, to be effective and boost local abundance and diversity of pollinators, this kind of action requires an accurate choice of the plant mixtures to be sown in terms of flower shape, colour, blooming periods, and balance between species. Here, we studied, by monitoring the presence of wild bees for three consecutive years, the development of two commercial mixtures of entomophilous plants developed for agroecosystems and of one non-commercial mixture in experimental plots sown in detention basins in two peri-urban floodplains in Tuscany, and their effect on the local bee community. We demonstrated that the total abundance of bees increased significantly, while the number of flowering species had an important effect on bee biodiversity, with bee species increasing by 16% for each additional flowering species. Despite the limited experimental area (less than 4 ha), according to the current red list, we found 17% of the bee species reported for Italy, including 7 Near Threatened and one Endangered species. Therefore, we showed that by selecting balanced mixtures of flowering plants, marginal zones along rivers in peri-urban areas are indeed very suitable to sustain an abundant and diverse bee community.

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Posters

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Since these areas are quite common and often not cultivated, a wild bee-friendly management of at least some of them could support the local bee community along the course of rivers with a favourable outcome on the surrounding agroecosystems.

Posters

From the nursery to the city: tackling the problem of ornamental invasive alien species. Research experiences for sustainable urban green spaces

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Since the 19 th century, ornamental horticulture has been the main pathway for the introduction of alien species in Europe, many of which have become invasive. The issue of Invasive Alien Species (IAS) remains a persistent topic of debate among diverse stakeholders; in particular, the use of alien (potentially invasive) plants as ornamentals. Cities, with their many public and private green spaces, are hotspots for the introduction and spread of invasive alien plants, with potential threats to human well-being and biodiversity and causing socio-economic impacts. Limiting the spread of invasive species is challenging. The research questions posed within Task 1.5 ask which plants are problematic, which are most commercially important, how are they viewed by stakeholders, and can alternative ornamentals be proposed? Starting from a selection of ornamental species that are also blacklisted—but are still offered by major Italian nurseries—we explored perception and management practices through a literature review and a questionnaire. Finding alternatives to IAS requires consideration of changing urban environmental conditions and abiotic stressors. To propose appropriate alternative ornamentals, we conducted two experiments. The first evaluated responses to salt and drought stress of two potential alternatives to the invasive *Ligustrum sinense* Lour.: *Ligustrum vulgare* L. (European native), and *Ligustrum japonicum* Thunb.; (non-invasive ornamental cultivar). The second analyzed the germination traits of twelve Mediterranean-native herbaceous species for use in wildflower meadows as nature-based solutions in urban greening initiatives. Our findings propose sustainable alternatives to IAS, supporting biodiversity conservation and addressing urban and climate-related challenges in Italian cities.

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Posters

DALIA database. Ecological and distribution features of woody taxa of Campobasso (Italy)

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The urban environment is a complex and dynamic system where urban woods provide essential ecosystem services. In the framework of the National Biodiversity Future Centre (NBFC), specifically within the "Urban Biodiversity-Spoke 5", we developed the DALIA relational database, which contains multiple ecological, functional, biogeographic and conservation features of tree, shrub, and liana taxa recorded in the FUA Campobasso, an inner small city of Mediterranean Region. DALIA includes published and unpublished data, plant taxa inventory obtained by vegetation surveys carried out in 2023 and 2024, and data referred to the urban greenery census of Campobasso Municipality.

DALIA db includes 170 species and subspecies (126 native and 44 alien) belonging to 46 taxonomic families (35 natives, 23 aliens).

Native plants are mainly Eurasian deciduous and Mediterranean evergreen; alien ones come from Temperate Asia, North America, and Tropical Asia. The most widespread alien invasive taxa are *Ailanthus altissima, Amorpha fruticosa, Lonicera japonica, Prunus laurocerasus, Robinia pseudoacacia*. Alien plants show different characteristics in terms of ecological and disturbance indicator values, indicating potentially greater competitiveness in highly disturbed environments than the native ones.

DALIA db reveals a high woody plant diversity when compared with other similar studies with a high percentage of native species and collects important ecological information that is useful for monitoring plant diversity, implementing ecological restoration actions, and supporting sustainable urban greenery plans and actions.

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Posters

Exposome-informed profiling of nutrition, lifestyle and functional health in people with Multiple Sclerosis

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Multiple sclerosis (MS) is a chronic neuroinflammatory disease with variability in progression, symptoms, and quality of life (QoL). The exposome, particularly lifestyle factors, has gained attention for its role in shaping health outcomes in MS. These modifiable factors influence disease progression and significantly impact QoL, psychological well-being, and function. This study examined lifestyle variables in MS patients from the EXPOSITION cohort (NCT06325358).

Eighty-six patients (29M/57F) were enrolled at the IRCCS Mondino, Pavia. QoL was measured with MSQoL-29. Nutritional status evaluation included phase angle (bioimpedance analysis) and waist-to-height ratio (WHtR) calculation. Validated tools gathered data on dietary inflammatory potential (Dietary Inflammatory Index, DII); adherence to the Mediterranean Diet (MEDI-LITE); physical activity level (IPAQ); and sleep quality (PSQI). Data were described as median(interquartile range).

The Expanded Disability Status Scale score [1.5(1.0–2.0)] showed full ambulation, despite mild-to-moderate deficits. MSQoL-29 scores were 67.5 (mental) and 51.9 (physical). Increased WHtR [0.5(0.4–0.6); cut-off 0.5], and reduced phase angle [5.3(4.9–5.8); reference M:7.3; F:6.4] suggested impaired nutritional status. Despite the Mediterranean Diet adherence [MEDI-LITE: 10.0(9.0–12.0); cut-off≥9.0], the diet was pro-inflammatory [DII: 4.1(2.5–5.0); cut-off 0]. Poor sleep quality [PSQI: 5.0(4.0–8.0); cut-off 5] and moderate activity [MET-min/week: 769.5 (231.0–1866.0)] were described.

Despite preserved autonomy and adherence to the Mediterranean Diet, impaired nutritional status, pro-inflammatory dietary profile, poor sleep quality, and moderate physical activity highlighted areas for targeted intervention.

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Posters

Exposome-informed profiling of nutrition, lifestyle and functional health in people with Multiple Sclerosis

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These results support the integration of multidimensional lifestyle assessments into clinical practice, promoting personalised, exposome-informed strategies to improve health trajectories in MS.

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Posters

Studying ascidian biodiversity in the Venice Lagoon: from past data to current conditions

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Biodiversity monitoring is essential to protect environments, particularly in vulnerable areas such as the Venice Lagoon, where human activities pose increasing threats. My research, within the PNRR project, focuses on ascidians, the dominant fouling organisms of the Lagoon in their climax, analysing the biodiversity through historical data analysis, seasonal samplings and species determination.

I examined literature from the 1700s to nowadays and sampled seven sites (six sites near Chioggia, one in Venice) between May 2023 and February 2025. Samples were preserved in 4% formalin for morphological study and absolute ethanol for molecular analyses, targeting a mitochondrial CO1 gene fragment. In addition, biodiversity was quantified using Shannon and Simpson indices.

Historical data show ascidians have been present since the 18th century. The last survey about ascidian biodiversity in the Venice Lagoon (Brunetti, 1979) identified 12 species. During my research, I notified 19 species, including six previously recorded species, cryptic species belonging to the genera Botryllus and Didemnum, and eight new records. Among them, many species are recognized as NIS and should be monitored for their invasive potential.

Basing on seasonal distribution, species richness peaked in autumn, aligning with reproductive periods. Highest diversity was observed along the banks of Chioggia and Venice, reflecting ascidian affinity for human-modified habitats. Both the biodiversity indices notified a meaningful biodiversity for most of the samplings, showing a rich and varied environment.

These results highlight the Lagoon as a dynamic environment, marked by temporal changes and NIS introductions; further sampling is needed to monitor NIS expansion.

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Posters

Micronized organic amendments from waste biomass to improve the fertility of urban soils and promote biodiversity and carbon sequestration

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Healthy soils can provide vital ecosystem services such as supporting plants and soil biodiversity, and contributing to food and fibers production. Since soil quality is globally deteriorating, due to a widespread degradation even accelerated by human activities, it is important to find solutions rehabilitating degraded and low-quality soils. Also urban and periurban soils may provide important ecosystem services, although their role is generally underestimated. In particular, the supply in soil of selected exogenous organic matter can elicit natural recovery processes and enhance soil quality and resilience. Therefore, we evaluated the action of vermicompost from buffalo manure (VC) and biochar from plant pruning residues (BC) in urban soils, both applied in a micronized form. The activities were carried out in the Fisciano campus of the University of Salerno and in a residential area in Avellino. The chemical results showed that treatments BC and BC+VC (only for some parameters), significantly improved soil fertility and microbial activity, especially inducing an increase in CEC, SOM and soil respiration. CPMAS NMR and PYR GC/MS techniques revealed that both BC and VC relevantly influenced the composition of soil organic matter, by increasing the hydrophobic index and the content of both nitrogen-based compounds and markers of microbial activity. These findings were enriched by agronomic evaluations which assessed a relevant plant growth and biostimulation after BC and BC+VC treatments. Concluding, we proved that the investigated strategy represents an innovative technique for restoring degraded soils, elicit plant activities and boost the urban biodiversity.

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Posters

Urban park cooling during an autumn heatwave: a large-eddy simulation of Villa Ada in Rome

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In 2023, ranked as the second warmest year since the pre-industrial era, Europe experienced persistent and spatially extensive heatwaves, especially in autumn. The intensification of extreme temperatures poses serious risks for cities, where over 75% of the population lives in densely built-up areas dominated by impervious materials that amplify the urban heat island (UHI) effect. Although urban green parks are generally surrounded by buildings, they provide a natural cooling effect through shading and evapotranspiration, helping to reduce temperatures inside and in surrounding neighborhoods.

To quantify the park cooling intensity (PCI), many studies have evaluated static indicators based on remote sensing imagery. Although this approach provides valuable information, it fails to capture how these effects change throughout the day. Few studies assess dynamic indicators such as wind velocity or turbulence quantities, and even those are mainly based on point measurements near the surface.

In this study, we use the Parallelized Large-Eddy Simulation Model (PALM) combined with buffer analysis to investigate PCI by evaluating the diurnal evolution of surface and near-surface air temperatures, friction velocity, and wind speed around Villa Ada Park in Rome during an anomalous heatwave in October 2023. To achieve this, we simulated three greening scenarios: 1) a baseline characterized by the current vegetation; 2) the park replaced entirely with short grass, and 3) the park replaced entirely by dense trees. Our results reveal pronounced spatial and temporal gradients in cooling intensity, with PCI exceeding 10 K and park cooling distance (PCD) reaching 300 m.

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Posters

Study of the deep anthozoan diversity of the Sicilian Channel

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A census of the deep biodiversity of the northern part of the Sicily Channel was carried out as part of the MedWind Project through a total of 140 ROV transects conducted between 135 and 885 m depth in 2021. A total of 60 anthozoan samples were analysed to confirm the taxonomic identity of the species. The analyses were conducted under light and electron scanning microscopy and considered various taxonomic characters such as corallum shape, polyp arrangement, structure and size, and macro and micro skeletal features. In total, 30 species belonging to 26 genera and 19 families were identified. Octocorals were the most diverse group of anthozoans in the collection, including about 63% of all the identified species, with representatives from both orders Malacalcyonacea and Scleralcyonacea. Some specimens have aroused particular interest within octocorals. These include seapens belonging to the genus *Protoptilum*, among which a colony with an unusual white colouration; a gorgonian of the genus *Muriceides* showing peculiar 4-5-pointed thornspindles from the coenenchyme; two specimens ascribable to the rare bathyal soft coral *Daniela koreni* von Koch, 1891; deep specimens of *Acanthogorgia hirsuta* Gray, 1857; several keratoisidids belonging to the genera *Isidella* and *Acanella*; a record of the rare bush-like gorgonian *Placogorgia massiliensis* Carpine & Grasshoff, 1975; an undetermined encrusting Corallidae. Further morphometric and genetic investigations will be needed to determine the proper taxonomic placement of some of these taxa. This biodiversity census confirms the Sicily Channel as a hotspot for deep species, highlighting its importance as a critical biogeographic crossroad.

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Posters

Effects of marine warming on the spatial distribution of *Posidonia oceanica* in marine ecosystems

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The dynamics of *Posidonia oceanica* density, an endemic Mediterranean seagrass species supporting high biodiversity levels, is analysed using the Advection-Branching-Death model, which considers both long-range competitive and short-range facilitative processes. The model exhibits two homogeneous equilibrium states: a continuous seagrass meadow and a bare soil, which may coexist under specific parameter regimes. The performed analysis shows that the mortality rate of *Posidonia oceanica*, linked to environmental variables, such as seawater temperature (including accumulated degree-day anomalies), is a key parameter predicting critical situations leading to biomass loss. The model is therefore used to investigate the effects of environmental stressors on the spatial distribution of *P. oceanica* meadows. The numerical analysis indicates that even mild increases in mortality rate can destabilize the populated homogeneous state via a Turing bifurcation, leading to the emergence of spatial patterns. These patterns correspond to patchy heterogeneous configurations, that enhance the plant's ability to cope with moderate environmental stress, revealing an intrinsic self-organizing and adaptive response of the ecosystem. However, when environmental changes-such as global warming or other persistent harmful conditions-push mortality rates beyond the threshold for the existence of patterned states, the system may undergo a transition toward desertification. In this case, this shift becomes irreversible, as simply reducing the mortality rate is insufficient to restore the original ecosystem. Overall, the model allows for the prediction of how adverse environmental factors may affect the spatial distribution and resilience of *Posidonia oceanica* meadows in Mediterranean marine ecosystems.

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Posters

A multimethodological framework for the assessment of Posidonia oceanica banquettes along the Sicilian coast (Southern Italy)

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Posidonia oceanica, an endemic seagrass of the Mediterranean Sea, is crucial for maintaining coastal ecosystem health. Among its less explored but ecologically relevant features is the accumulation of dead leaves, known as banquettes. Banquettes provide important ecosystem services, but they are often removed in tourist areas and sent to landfills, instead of their on-site maintenance. In this context, our study aimed to provide an integrated methodological framework for evaluating the ecological and socio-economic implications of banquettes removal practices. Sampling activities were carried out to record thickness, length, width, and GPS coordinates along each strand based on the season's deposition. These measurements allowed the calculation of volume and surface area across the investigated coasts and their spatialization. In spring, the total volume was 45,334 m^3, and the surface area was 109,464 m^2; in fall, the total volume was 181,890 m^3, while the surface area was 237,749 m^2. Subsequently, laboratory analyses were conducted to estimate the amount of carbon and other elements contained in the deposits. This step was crucial to determine the amount of carbon contained in the banquettes, and the nutrients that are potentially generated by the remineralization processes and loss in the case of landfill transfer. Moreover, cost-benefit analyses were proposed for various scenarios, including landfill disposal, on-site maintenance, and reintroduction into the marine environment. In conclusion, this research aims to fill the lack of studies on banquettes management, providing useful information to policy makers to implement effective sustainable management practices.

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Posters

Genetic analysis of SARS-CoV-2 in wastewater

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Wastewater represents a carrier of human pathogens in the environment, and for this reason, it is very useful tool for tracking infectious diseases. Since SARS-CoV-2 is also excreted through feces, wastewater surveys provide information on the spread of the disease. In this study, we analyzed the genetic variability of SARS-CoV-2 isolated from wastewater samples and compared it with sequences obtained from human hosts. Our analyses revealed broad temporal and spatial patterns, although no significant structuring was detected. An analogous trend was observed in SARS-CoV-2 from human samples. The molecular dating suggested that the timelines of the two outbreaks were comparable. Moreover, the evolutionary rates of the main variants of SARS-CoV-2 from wastewater samples were similar to those found in human samples, reflecting the trends observed during the pandemic.

These results demonstrate how wastewater monitoring can be useful in spotting infection hotspots before individuals exhibit symptoms. In general, a continuous genome-based monitoring of the aquatic environment is needed since pathogens found in wastewater can impact aquatic organisms, resulting in diseases, death, and changes in communities' biodiversity.

In addition, since the pathogens found in wastewater samples reflect the pathogens circulating among humans, monitoring human health through wastewater analysis can provide information on the environmental health, and consequently on the health of the animals living there. This vision aligns with the One Health approach, which highlights the importance of an integrated approach to health that considers the reciprocal influences between humans, animals, and the environment.

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Posters

A Monte Carlo procedure for the estimation of species coverage in dunes

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Monitoring and assessing natural resources and biodiversity is an important challenge in environmental and ecological surveys. Species coverage serves as a key indicator of ecosystem health, but it is often impractical to conduct complete censuses. As a result, reliable statistical methods for estimating species coverage are essential.

In a design-based inference framework – where the population is viewed as a fixed set of locations with fixed values of the survey variable attached to each location – the choice of sampling scheme adopted for placing sample sites across a continuum plays a crucial role in ensuring reliable inference. Given the presence of spatial autocorrelation and heterogeneity, it is important to use sampling strategies that ensure that the sample points are "well spread" across the study area. Spatially balanced sampling can be achieved through tessellation-based methods, such as tessellation stratified sampling and systematic grid sampling, or through customized, more complex sampling schemes.

This study demonstrates that species coverage in dune ecosystems, typically assessed using strip sampling, can be effectively expressed as an integral and, consequently, unbiasedly estimated using a Monte Carlo estimator. Various spatially balanced sampling schemes for strip placement are compared in a simulation study. Finally, a real-world application is presented.

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Posters

Protective effects of plant *Ceratonia siliqua* leaves extract against palmitate-induced liver steatosis

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Plant-derived matrices represent a valuable source of bioactive compounds. To this aim, we focused on *Ceratonia siliqua* (C) leaves extract to observe its possible protective effect on fatty acids-induced hepatic steatosis. The experimental design was based on the analysis of dose-dependent effects of this extract at 6.25, 12.5, 25, 50 μg/mL doses on cell viability (3-[4,5-dimethylthiazol-2-yl]-2,5 diphenyl tetrazolium bromide - MTT assay) and the combination of the higher doses with 500 μM saturated fatty acid palmitate (PA) for lipid accumulation (oil red staining), reactive oxygen species (ROS) production (dichlorofluorescein - DCF assay) ad endoplasmic reticulum (ER) stress induction (western blotting analysis) in an in vitro cellular hepatic model (Hepg2). The results showed that the extract attenuated the lipid accumulation and the redox unbalance induced by PA. Regarding ER stress, PA induced the unfolded protein response (UPR) with an increase in GRP78 (Glucose-regulated protein) content, involved in early ER stress and CHOP (C/EBP homologous protein) content, involved in late ER stress. In contrast, the extract decreased GRP78 and CHOP content, suggesting a resolution of the protein misfolding. These preliminary results showed that *C. siliqua* leaf extract could be able to counteract PA-induced hepatic steatosis.

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Posters

Groundwater biodiversity in Pianosa (Tuscan Archipelago-Italy) offers clues to the ecological uniqueness of small islands

Tiziana Di Lorenzo[1,2,3,4], Agostina Tabilio Di Camillo[1,5], Leonardo Piccini[6], Diana Maria Paola Galassi[5], Mariella Baratti[1], Guia Morelli[7], Jacopo Cabassi[7], Marco Doveri[8,9], Linda Franceschi[8], Matia Menichini[8]

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Groundwater biodiversity on small islands remains largely unexplored. This gap is critical, as insular groundwater are highly vulnerable to climate change and marine intrusion. This study presents a survey on groundwater fauna of the Pianosa Island (Tuscan Archipelago-Italy). Formed by Neogenic-Quaternary sedimentary rocks, the island features a calcarenitic unconfined aquifer and sandy-gravel confined-semiconfined aquifers. Ten wells were sampled during May and October 2024: eight shallow (13–23 m/calcarenite aquifer) and two deep (55–77 m/sandy-gravel aquifers). Physicochemical parameters ranged as follows: electrical conductivity 835–6760 µS/cm, pH 7.7–8.8, temperature 16.6–22°C. Trace elements were below Italian contamination limits. We collected five crustacean species: three stygobites (obligate-groundwater dwellers) and two stygophile (groundwater-facultative) species. Among the stygobites, *Parapseudoleptomesochra* sp. and *Nitocrella stammeri* (Copepoda) belong to lineages with a direct marine origin, whereas the bathynellacean taxon (Syncarida) represents a continental limnicoid lineage that adapted to freshwater since Mesozoic. *Parapseudoleptomesochra* sp. and the syncarid species were found in both deep wells, alongside *N. stammeri*, which was also detected, in lower abundances, in four shallow wells.

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Groundwater biodiversity in Pianosa (Tuscan Archipelago-Italy) offers clues to the ecological uniqueness of small islands

Tiziana Di Lorenzo[1,2,3,4], Agostina Tabilio Di Camillo[1,5], Leonardo Piccini[6], Diana Maria Paola Galassi[5], Mariella Baratti[1], Guia Morelli[7], Jacopo Cabassi[7], Marco Doveri[8,9], Linda Franceschi[8], Matia Menichini[8]

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The groundwater biodiversity will also be analyzed using eDNA techniques. This molecular approach will offer insights into local animal communities, generating data to inform conservation strategies for the subterranean ecosystems of small islands. Seawater intrusion is detected in some wells, generating a now widespread warning on the effects of saltwater intrusion in aquifers that could no longer be usable for drinking and agricultural purposes and putting at risk the resident stygobitic fauna adapted to life in freshwater.

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Posters

The chance of staying alive: what happens to terminology and cryptic species when experts disagree

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This abstract examines a largely overlooked but critical issue in biodiversity science: the impact of terminological disagreement among experts on the recognition and conservation of cryptic species. Scientific discourse often assumes a shared understanding of key concepts and terms, particularly within expert communities. However, this assumption of consensus can obscure the genuine uncertainty and contestation that characterize many domains of taxonomic research. In the case of cryptic species - genetically distinct organisms that are morphologically similar - the stakes of terminological inconsistency are especially high. By analyzing a series of case studies from recent literature and fieldwork, this paper explores how divergent terminologies reflect deeper epistemological divides and how they affect data integration, policy-making, and conservation priorities. We argue that terminological disagreements are not merely semantic but have real consequences for biodiversity monitoring and protection, especially in the context of rapid ecological change and limited conservation resources. Recognizing and making explicit these epistemic uncertainties is not a weakness but a necessary step toward more transparent, inclusive, and effective biodiversity science. Through this lens, we advocate for a more reflexive approach to scientific terminology - one that acknowledges its provisional nature and actively engages with its role in shaping the fate of the species it seeks to describe.

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Posters

i-Tree Canopy and Life Cycle Assessment to evaluate net environmental performances of Mediterranean urban forests

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Tree-planting initiatives in urban contexts have been launched worldwide to address challenges related to air pollution and climate change. Urban forest management activities may affect emissions, thereby reducing their net performance,and research on this remains limited. This study assesses net environmental benefits of Mediterranean urban forest management and planting strategies by comparing Ecosystem Services (ES) supply, using the i-Tree Canopy, with the potential environmental impacts of implementation, evaluated through Life Cycle Assessment (LCA). The core assumption is that the higher Tree Canopy Cover (TCC), the higher ES supply, particularly in terms of air pollutant removal (PM2.5 and SO_2) and CO_2eq sequestration. The planting and growth of an urban forest over time were simulated on a 1-hectare plot, featuring three common Mediterranean oak species. Three alternative scenarios were developed, representing a different strategy to achieve 100% TCC by target years 2030, 2050, and 2100, each reflecting decreasing management intensity. Results indicate that the CO_2 net balance is primarily influenced by planting density, while the net balance for air pollutants is more strongly affected by management practices. High-intensity management, oriented to short-term canopy targets, was found to be unsustainable in terms of pollutant outcomes. The integrated LCA-ES modeling approach supports strategic planning and management of urban forests by maximizing net environmental benefits and accounting for temporal growth as a key factor. Ultimately, the study represents an innovative effort to assess urban forest contributions in offsetting pollutants and CO_2 emissions across diverse urban and climatic contexts, in alignment with policy goals over different time horizons.

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Posters

BioDiverCity, a board game to talk about urban biodiversity

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Urban biodiversity is the variety and abundance of life in a city and influences the well-being of city-dwellers and the quality of life of cities via multiple pathways. At the same time, urbanization impacts biodiversity and ecosystem services through several ways.

What do we know about biodiversity? How do we act every day to protect it? To raise citizens' awareness on urban biodiversity issues, we decided to create the board game BioDiverCity.

The basic principle of the game is that the city ecosystem space is finite. Over the course of the game, the human/nature balance in the city will change. The city with its inhabitants represents a system/laboratory on which to experiment: to what extent can the biodiversity system be resilient? Is it possible to predict the point of no return? And above all... if a restoration of balance is possible, what is the cost, the effort required?

BiodiverCity is semi-cooperative game, with a winner at the end of the game, that induces social dynamics with ethical implications among players.

The game is neutral and not polarized towards activities that promote or damage biodiversity: each player is free to choose the attitude he prefers and can dedicate himself to both activities, being able to win the game with virtually any type of choice. Victory will depend on the state of the system, which in turn depends on collective choices.

BioDiverCity has been designed as an educational resource for schools but can be played also with family or friends.

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Posters

Ecological behavior of *Dictyota dichotoma* living in an acidic volcanic marine environment at Fuencaliente, La Palma (Canary Islands)

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Water acidification is a natural phenomenon in environments affected by volcanic activity. These unique habitats allow studying the behaviour of the algal populations in relation to pH gradients to assess their survival strategy. This study investigates the physiological and structural responses of the brown algae *Dictyota dichotoma* to ocean acidification in Fuencaliente (Spain), where a natural acidification zone is located. Replicated algal thalli were collected along a pH gradient—acidified, transitional, and control—and analyzed for anatomical and morphological traits, photosynthetic efficiency, pigment content and antioxidant capacity. Additionally, algal cover in each sampling site was assessed. Photosynthesis was not affected by the pH gradient. Conversely, algal cover and thallus dry matter content (TDMC) increased in the acidified site, suggesting a potential physiological advantage under CO_2-enrichment conditions due to an enhancement of CO_2 availability and fixation. Our data also evidenced a different behavior among surface thallus area (STA) and total chlorophylls, which dropped along the increasing pH gradient, while thallus carotenoid and antioxidant charge increased. This may reflect the occurrence of metabolic regulatory strategies in response to acidification. Morphological analyses revealed shorter thalli at the acidified site. In contrast, anatomical analysis showed a progressive thinning of the thallus tissue in acidic conditions, primarily due to a reduction in the cortical cell layer. Our data indicate that stable photosynthetic efficiency, anatomical modifications, and prompt antioxidant response are likely specific ecological attributes conferring *D. dichotoma* both functional and structural plasticity, allowing its adaptation and persistence under ocean acidification.

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Posters

Integrating morphological, physiological, and molecular approaches to monitor photosynthetic biodiversity in the Venice Lagoon

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The Venice Lagoon, one of the largest lagoon systems in the Mediterranean, is a biodiversity hotspot. A bibliographic study spanning from 1800 to 2023 identified 902 photosynthetic species in total, with 375 of these recorded in the last 23 years (2000-2023). The research revealed significant trends in biodiversity: sharp decrease in charophytes and heterokontophytes, gradual decline in chlorophytes, and increase in rhodophytes. Ecological indicators (EEI and MaQI) showed a decrease in species with high ecological adaptability throughout the study timeframe. During 2024 we conducted a seasonal monitoring on salt marshes and wooden poles in the entire lagoon. Some species have been found in specific seasons and sectors, while other are ubiquitous. Currently, we identified 20 higher plant species alongside 16 rhodophytes, 13 heterokontophytes, and 17 chlorophytes.

The Venice Lagoon is also a hotspot for invasive species. One notable invader is Sporobolus anglicus, which has been observed outcompeting the native *S. maritimus*. To better understand their responses to climate change, we conducted a controlled laboratory experiment exposing both species to an artificial heatwave. We monitored various morpho-physiological parameters, including survival rates, photosynthetic efficiency, antioxidant defenses, changes in photosynthetic pigments, photosynthetic membrane organization, and metabolite variations. These measurements were taken before, during, and after the simulated heatwave event. While transcriptomic data analysis is still ongoing, preliminary results indicate that *S. anglicus* exhibits remarkable resilience and adaptability. This invasive species demonstrated full recovery from heatwave conditions, whereas *S. maritimus* showed poor survival rates, with 75% mortality under stress.

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Posters

Effect of co-culture of *Nannochloropsis salina* and *Xanthophyllomyces dendrorhous* on cell growth and lipid production

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Co-cultures of microalgae and yeast are gaining increasing attention as a promising strategy to enhance the production of biomass and high-value metabolites. However, since these microorganisms have specific cultivation requirements, optimizing growth conditions is essential to ensure the correct development and productivity of the co-culture. This study investigates the co-culture of a marine microalga *Nannochloropsis salina* and the yeast *Xanthophyllomyces dendrorhous* as well as the dynamics of their interaction in co-culture. The selection of a medium compatible with the physiological needs of both species, proved to be crucial for their survival and co-existence. The results show that *N. salina* and *X. dendrorhous* are able to coexist even in suboptimal conditions, as long as the growth parameters are properly calibrated to support both species. A salinity of approximately 18 g/L and a glucose concentration of 10 g/L were found to be suitable for the growth of the two species in co-culture.
Observations of pH dynamics suggest that the metabolism of *N. salina* may help buffer the acidification caused by *X. dendrorhous*, leading to a stabilized pH around 6 in co-culture—intermediate between the values recorded in axenic cultures of the yeast (pH ~5) and the microalga (pH ~8.5).
Furthermore, the low levels of polyphenols (2,37 ± 0,32 μg GAE/ mg DW) and antioxidants (1,01 ± 0,15 μM vitamin C/ mg DW) detected in the co-culture suggest a lack of direct competition between the microorganisms, indicating a relationship based on coexistence rather than antagonism.

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Posters

Local ecological knowledge as a tool for monitoring recreational fisheries in Ancona harbour

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Recreational fishing represents a significant, yet often underestimated, component of coastal fisheries, making effective management and sustainability assessment challenging.
The aim of this study is to characterise and describe the recreational fishing carried out at the Ancona harbour (Italy). To gather the necessary information, we employed the Local Ecological Knowledge (LEK), a well established approach that enables the collection of information directly from local fishers. Through semi-structured interviews with local fishers and regular harbour users, we collected both qualitative and quantitative data on fishing effort, target species, temporal trends, perceived ecological changes and the pollution caused by fishing activities. To ensure the validity of the interviews, it is essential that interviewers are skilled in species identification and are selected from among fishers with at least ten years of experience in the area.
Our results show that LEK provides valuable insights into fishing practices, seasonal patterns, and species abundance, especially in data-poor contexts. This research highlights the importance of directly involving fishers and their knowledge in coastal resource management, offering a cost-effective and context-specific approach to monitoring recreational fisheries in Mediterranean urban harbours.

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Posters

An integrative framework for solving taxonomic challenges in the *Cystoseira* s.l. complex

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Brown algae of the *Cystoseira sensu lato* (s.l.) complex are fundamental components of Mediterranean marine forests, yet their taxonomic delimitation remains a major challenge due to their marked phenotypic plasticity, ongoing speciation and frequent hybridization. These taxonomic uncertainties, exacerbated by the addition of newly described species, hinder both conservation efforts and ecological research.

To address these issues, we developed an integrative framework that combines advanced molecular tools with detailed morphological analyses, enabling precise species identification and robust phylogenetic resolution. This standardized approach includes rapid DNA extraction protocols, high-resolution molecular markers (COI, RuBisCO, ITS2) and rigorous phylogenetic analyses, ensuring reliable outcomes at both inter- and intraspecific levels.

Our comprehensive dataset, derived from specimens collected across Atlantic and Mediterranean, provides crucial insights into the taxonomy of *Cystoseira s.s.* and resolves long-standing ambiguities. This framework not only improves the accuracy of species classification, but also informs future research, conservation planning and ecosystem management strategies for Mediterranean marine forests.

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Posters

An integrated approach for the conservation and restoration of *Fucus virsoides*, an endemic glacial relict at risk of extinction

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On rocky shores of temperate and cold regions, *Fucus* species (Fucales, Phaeophyceae) form complex habitats that underpin critical ecosystem services. *Fucus virsoides* J. Agardh, endemic to the Adriatic, is the only *Fucus* species in the Mediterranean. Historically, it formed extensive canopies from northern Italy to southern Albania, but populations have severely declined.
We reconstructed the long-term distribution of *F. virsoides* and elucidated factors driving its decline by investigating historical and current occurrences since the 19th century. Then, we conducted laboratory experiments on putative stressors – nutrient changes (quantified via O_2 evolution and PAM fluorimetry) and desiccation (inferred from water relations parameters) – and modelled current/future distributions under multiple climate scenarios.
Our results reveal a persistently declining trend, with only 20 fragmented populations remaining in the whole Adriatic basin. Nonetheless, lab experiments indicate that *F. virsoides* retains notable acclimation capacity across a broad range of conditions and tolerates water stress. Modelling forecasts that rising atmospheric temperatures pose the principal threat, with projections showing ongoing habitat reductions leading to extinction under the most severe RCP scenario.
By integrating historical data analyses, ex situ restoration pilots, and species distribution modelling, this study furnishes a comprehensive status evaluation of *F. virsoides*, clarifies mechanisms underlying its decline, and underscores the urgent need for targeted conservation/restoration measures to prevent extinction of this glacial relict.

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Posters

Life-cycle thinking approach for the evaluation of nature-based solutions in urban settings

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The objective of this study is to apply an integrated ES-LCA methodology to calculate the net environmental benefits and drawbacks of a greening redevelopment at the Milano-Bicocca University Campus (Italy). The scope is to identify sustainable and effective urban restoration alternatives for future similar implementations. At the pilot site, an intensive (and accessible) green roof has been recently built. Here, selected trees, shrubs and herbaceous species have been planted to deliver multiple benefits, with the aim of enhancing and supporting biodiversity in the area. After the collection of foreground life cycle inventory data, a preliminary impact assessment has highlighted the implementation's hotspots, i.e. the most impactful components. This depends on the upstream production of some construction materials, such as the substrate or the granite for borders and seats. Several scenarios have been developed to evaluate possible improvements of deploying alternative materials, for example recycled or organic ones. Moreover, the NbS benefits have been modelled as "ES supply", such as mediation of air pollution and carbon sequestration. Finally, the integration of endpoint impacts on ecosystems and positive effects of the greening implementation highlights the importance of species selection and provenance in the NbS planning process.

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Posters

Microencapsulation by spray drying: a strategy to stabilize and deliver bioactive natural compounds from sustainable sources in healthy applications

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The growing demand for natural and safe products in the pharmaceutical, cosmetic, and food industries has intensified interest in bioactive compounds derived from sustainable sources. These molecules offer antioxidant, antimicrobial, anti-inflammatory, and other health-promoting properties, making them attractive for functional foods, nutraceuticals, and therapeutic formulations. Many of these compounds can be sourced from agricultural wastes and food processing by-products, supporting circular economy strategies and enhancing the exploitation of natural resources. However, the practical application of natural derivatives such as extracts, phyto-complexes or compounds, faces several limitations. Many are chemically and physically unstable, degrading in the presence of light, oxygen, moisture, or heat. Others suffer from poor water solubility or limited bioavailability, reducing their functional efficacy. In pharmaceutical formulations, these challenges affect dosing accuracy and therapeutic performance; in food systems, they can impact taste, appearance, and shelf life. Spray-dried microencapsulation represents a scalable and cost-effective technological solution to overcome these critical issues. This technique converts liquid bioactive formulations into dry powders by entrapping active compounds within a polymer matrix during atomization and rapid drying. The resulting microparticles protect sensitive compounds, enhance solubility and bioavailability, and enable controlled or targeted release. In food systems, they can also mask undesirable tastes or odors, while improving stability under processing and storage conditions. Spray-dried microencapsulation thus represents a versatile and scalable approach to the valorization of natural resources preserving the functional properties of bioactives. It enables their broader application and supports their sustainable application as active ingredients in high-value healthy sectors.

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Posters

Mitigating traffic-related air pollution with evergreen shrubs in urban microenvironments: a case study from Bergamo, Italy

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Urban air pollution, particularly from traffic emissions, is a critical environmental and public health issue. Microenvironments such as bus stops represent hotspots of human exposure, yet they are often overlooked in air quality mitigation strategies. While green infrastructure (GI) has proven effective in improving air quality, most studies focus on large-scale green spaces, with limited attention to small-scale vegetation in dense urban settings.
This study evaluates the role of evergreen shrubs in mitigating particulate matter (PM10) pollution in a high-traffic urban microenvironment. The research was conducted at a near-road bus stop in Bergamo, Northern Italy, during the autumn and winter seasons—periods associated with elevated PM concentrations. Two common evergreen species, Prunus laurocerasus and Pyracantha 'Navaho', were selected for their prevalence in urban landscaping.
Results showed that the shrubs reduced PM10 concentrations by 20% in winter and 16% in autumn compared to adjacent areas without vegetation. Additionally, concentrations of metal elements bound to PM10 decreased by an average of 5%, with copper (Cu) showing the highest removal rate at 64%.
These findings demonstrate the potential of small-scale, evergreen vegetation to reduce air pollution in traffic-heavy areas. Integrating such green elements into urban planning offers a sustainable, low-cost strategy to improve air quality and public health in densely populated cities.

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Posters

The efficiency of moss polsters for constructing a nation-wide database for monitoring modern pollen deposition: new methodological perspectives

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The study of modern pollen deposition has disclosed itself as an impressive contributor for reconstructing Quaternary climate changes, land cover and land use, exploiting the present-day relationship between pollen, vegetation and climate parameters. Moss polsters are a natural pollen trap at disposal of researchers and pervasive throughout all ecobiomes, surpassing the spatial and temporal limitations of artificial pollen traps. Pollen grains are retained within the polster, that embodies the pollen deposition of a few years. Here we introduce a new sampling field protocol that enables to effectively collect polsters and record the surrounding vegetation. Our protocol requires to collect three moss samples for each site along a 100 m linear transect, in order to cover the vegetational variability of the area. Vegetation surveys with Braun-Blanquet indexes are carried out for later comparison of pollen spectra and present vegetation. The effectiveness of our protocol was tested within the PRIN 2022 PNRR ALIVE Project. In approximately one year we were able to increase exponentially the resolution of pre-existing data, covering the whole Italian territory and creating the first national harmonized modern pollen database. Preliminary results convey up-do-date information on the reforestation occurring in Italy since WWII and can precisely show recent spatial development of single taxa.

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Posters

Indicators as a tool for monitoring biodiversity in *Fagus sylvatica* L. stands: Complex Adaptive System (CAS) approach

Roberta Ferrante[1,2], Cristina Vettori[1,3], Cesare Garosi[1], Davide Travaglini[1], Hojka Kraigher[4], Tanja Mrak[4], Šibanc Nataša[4], Tanja Mrak[4], Kristina Sever[5], Andrej Breznikar[5], Miran Lanšćak[6], Mladen Ivanković[6], Donatella Paffetti[1,2]

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Over the past few years, anthropogenic activities and climate change have caused a substantial loss of biodiversity at ecological, species, and genetic diversity levels. Indeed, it has long been established that forests should be managed in an ecologically sustainable way. Forests are essential to life, and conserving their biodiversity and genetic resources is crucial for environmental, economic, and social well-being. Biodiversity conservation is one of the main goals of ecologically sustainable forestry. This study assesses how current climate changes affect forest ecosystems, considered as Complex Adaptive Systems, and whether and how these systems can return to equilibrium after disturbances. Biodiversity and adaptation were considered emergence proprieties arising from the interaction of the system's elements. We calculated five classes of ecosystem biodiversity indicators (genetic, stand structure, deadwood, microhabitat, and soil diversity indicator) for describing and monitoring biodiversity in 12 demonstration sites of *Fagus sylvatica* L. stands of the project LIFE SySTEMiC located in Italy, Croatia, and Slovenia. Moreover, the study aims to identify the management practices that improve natural regeneration and, through genetic recombination, enhance the genetic potential of beech trees. Our findings suggest that unmanaged forests or those managed through individual tree selection tend to maintain ecological balance more effectively.

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Indicators as a tool for monitoring biodiversity in *Fagus sylvatica* L. stands: Complex Adaptive System (CAS) approach

Roberta Ferrante[1,2], Cristina Vettori[1,3], Cesare Garosi[1], Davide Travaglini[1], Hojka Kraigher[4], Tanja Mrak[4], Šibanc Nataša[4], Tanja Mrak[4], Kristina Sever[5], Andrej Breznikar[5], Miran Lanšćak[6], Mladen Ivanković[6], Donatella Paffetti[1,2]

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These insights contribute to a deeper understanding of the dynamic responses of forest ecosystems to environmental pressures and anthropogenic activity, emphasizing the need for management strategies that support long-term ecological stability.

Posters

Larger urban green areas host richer and more diverse aculeate wasp communities across four Italian cities: insights for improving urban park management

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Italy is a hotspot for aculeate Hymenoptera, including wasps which are important providers of ecosystem services such as pest control and pollination. Unlike other groups (e.g. bees), the biodiversity of aculeate wasps in urban environments has not been studied. Urbanisation is one of the main land use changes leading to the reduction and fragmentation of natural green areas. Wasps were sampled by active netting along a gradient of green area size and fragmentation (10 sites per city) in Florence, Milan, Rome and Turin. Sites were further characterised in terms of land use (e.g. proportion and spatial arrangement of grassland, forest and sealed surfaces). Field collections were carried out for one year, between May and September, standardising the effort in terms of number of operators, duration and area covered. A total of 3003 wasps were sampled, with similar abundances in each city (713 in Florence, 742 in Milan, 840 in Rome, 708 in Turin) accounting for 97 species (32 in Florence, 34 in Milan, 53 in Rome, 58 in Turin). Species turnover between cities was highlighted, with 14 species common to all cities and 57 specie exclusive to one city. Reduced grassland cover, due to urbanisation, had a negative effect in terms of species number (q0), community homogeneity (q1) and dominance (q2). These results may therefore help urban park management to maintain adequate communities of aculeate wasps by increasing grassland cover. Further studies will investigate whether urbanisation affect the functional composition of these communities, thus testing the "urban homogenisation hypothesis".

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Posters

Urban soundscape monitoring in Milan and Turin: a preliminary eco-acoustic assessment using BirdNET and acoustic indices

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Urbanization profoundly affects biodiversity, highlighting the need for efficient and scalable monitoring tools. This study presents a preliminary assessment of avian biodiversity in Milan and Turin, Italy, using passive acoustic monitoring over a one-week period. Fifteen autonomous recording units were deployed across diverse urban environments in both cities to capture soundscape data in the breeding period. Recordings were analyzed with BirdNET—a deep learning tool for bird species identification—and a suite of eco-acoustic indices: the Acoustic Complexity Index (ACI), Acoustic Diversity Index (ADI), Acoustic Richness (AR), Acoustic Entropy (H), and Normalized Difference Soundscape Index (NDSI). These results were compared to manual field surveys conducted at the same locations, providing ground-truth data to validate and contextualize the automated analyses.

Preliminary findings revealed spatial and temporal differences in acoustic indices between the two cities, reflecting variations in urban structure and green space distribution. BirdNET identified a wide range of bird species (more than 60 species), with some exhibiting city-specific patterns of occurrence. The integration of eco-acoustic indices, automated species detection, and human observations offers a robust, multi-dimensional approach to urban biodiversity monitoring. These results highlight the potential of combining passive acoustic monitoring with machine learning and field validation to support long-term biodiversity assessments and inform evidence-based urban planning.

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Posters

Exploring soil fauna in urban environments: earthworms and microarthropods in public parks and green spaces of Milan, Italy

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We present preliminary findings from a study on soil fauna biodiversity in urban environments, focusing on microarthropods and earthworms. Conducted in public green areas across Milan (Italy), this research is part of a broader project investigating urban soil properties and ecological functionality.
Five categories of green areas were selected: lawns of urban parks inside and outside the historic centre, lawns and forests of peri-urban parks and lawns of small urban green spaces. Fifteen sampling plots (4x4 m) were identified. Earthworms were collected by sorting soil blocks (25x25 cm, 20 cm depth) and stored for counting, weighing, and taxonomic identification. Soil samples for microarthropods were collected to determine the QBS-ar index. Soil was sampled by layers (0–10 cm, 10–20 cm, 20–40 cm). Bulk density, soil resistance to penetration, water infiltration and soil temperature and moisture were also measured.
Earthworm abundance and biomass ranged widely across the sites (68-1100 individuals m-2; 26-333 g m-2). Endogeic earthworms were predominant in urban sites (more disturbed), while anecic earthworms were prevalent in peri-urban sites (more natural conditions). Considering adult individuals, three species of epigeic, nine of endogeic, and six of anecic earthworms were identified, along with a single specimen of an exotic species. QBS-ar values ranged from 56 to 136, with forests showing the highest values. Overall, QBS-ar values were relatively low, mostly below the threshold proposed for good quality soils, but consistent with other urban soil studies in Italy.
Ongoing work will assess how soil fauna patterns relate to soil properties and land use.

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Posters

Exploring soil biodiversity: integrative taxonomy of Italian *Pauropoda*

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Soil ecosystem harbours a high diversity of edaphic fauna. Although importance and key role of microarthropods in soil ecosystem dynamics is well known, some groups' identification is not. Many taxa are highly understudied due to difficulties in analysing their morphology and molecular diversity. Among these, *Pauropoda* (Myriapoda), that are represented globally by more than 800 known species. Main taxonomic characters are related to the segmented trifurcate antennae with the antennal globulus, and the species-specific anal plate. Concerning molecular data, around 150 DNA sequences are available in online barcoding databases, only 49 coming from 11 described species, while the rest are from unknown species, none from Italy.
This study aims to improve the knowledge about Italian species of Pauropoda, and generally to optimize protocols used for molecular analysis and morphological observations. Sampling was conducted in Emilia-Romagna and Tuscany; the specimens, conserved in ethanol, were observed on slides with glycerol for identification, and to take voucher pictures of the main taxonomic characters. A non-destructive DNA extraction was performed, retrieving animal's carcass. DNA amplification was performed for 18S and COI, using different protocols and primer pairs to develop a standard molecular approach.
This new methodology based on the use of glycerol allowed us to obtain more accurate morphological observation of taxonomic characters, harder to provide from carcass examination. Further analysis will focus on expanding available knowledge about genetic relationship of different species of *Pauropoda*.

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Posters

Study of genetic diversity and implications for conservation of *Limonium etruscum* Arrigoni & Rizzotto, a critically endangered endemic species of Tuscany

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Limonium etruscum is a hemicryptophyte belonging to the Plumbaginaceae family, which shows very small and isolated populations adapted to the retrodunal habitat of Tuscany. Coastal erosion and urbanization represent the main threats to the species, leading to its inclusion in the Italian red list as critical endangered. In recent years, the distribution and ecology of *L. etruscum* have been extensively studied. However, to date, no investigation has been performed to evaluate the genetic diversity of the species. The work aims to (i) investigate the genetic structure of *L. etruscum*, and (ii) identify potential Conservation Units. Plant material was collected from ten sites along the distribution range of the species. DNA was extracted using the CTAB 2X protocol and analysed with an AFLP method. The profiles obtained were examined with GeneMarker and converted into a binary matrix. Genetic diversity metrics and the Analysis of Molecular Variance (AMOVA) were obtained using Arlequin software. The Mantel test was performed in the R environment to assess the occurrence of isolation by distance (IBD). AMOVA results indicated slight but significant genetic differentiation among populations (24.2%), and a more significant proportion of genetic variation within populations (75.8%). The Mantel test showed that IBD was not significant in *L. etruscum*. Talamone site exhibited low levels of heterozygosity (He=0.176), suggesting a probable event of founder effect. Conversely, one of the two populations from Alberese showed higher levels of He (0.302), which is likely the result of past in-situ reintroduction using ex-situ propagated germplasm.

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Posters

Set-up of a chlorophyll removal methodology from leaf extracts

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The plant kingdom is a key source of bioactive compounds, but its exploration is hindered by challenges such as limited availability of plant material, restricted sample quantity, and complex compound isolation. While plant leaves are generally abundant and highly available, co-extracted chlorophylls interfere with analyte analysis, quantification, and biochemical assays due to their UV/Vis absorbance and fluorescent properties [1]. Therefore, removing chlorophyll from crude extracts is crucial before testing.
Existing methods often lead to the unintended loss of bioactive metabolites [2]. Therefore, this study presents a rapid, cost-effective, eco-friendly, and scalable solid-phase extraction (SPE) protocol for selective chlorophyll removal. The method utilizes inexpensive, reusable, and commercially available cartridges, requires standard lab equipment, and is completed in just 10 minutes, making it suitable for Nature-Aided Drug Discovery from initial screening to large-scale compound isolation.
Optimal conditions were established using *Corylus avellana* L. extracts and validated on twenty leaf extracts from different taxa. UV/DAD-HPLC and HPLC-MS analyses confirmed comparable chromatographic profiles before and after treatment while UV chlorophyll quantification [3] demonstrated 85% selective removal of chlorophyll a and b.
The developed method efficiently removes chlorophylls while preserving the phytochemical composition. Finally, Folin-Ciocâlteu and DPPH assays confirmed no alteration in total phenolic content or free radical scavenging properties, supporting its applicability in bioactive compound research.

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Posters

Towards the reuse of dredged sediment: remediation strategies and regulatory frameworks barrier

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Dredging and the result dredge sediment can have different environmental impact. Nevertheless, there are different strategies that can reduce this impact. This strategies presents a promising opportunity for the reutilization of dredged material in various sectors, including agriculture, construction, and environmental restoration.

However, regulatory barriers can hinder the sustainable application of these sediments.

Here, we explore the current state-of-the-art and future perspectives of dredged sediment restoration, with a particular focus on identifying regulatory obstacles within the European and Italian context.

A bibliometric analysis was made to quantify and visualize the evolution trend of publications.

Additionally, a review exercise was undertaken to map the existing evidence, incorporating both scientific articles and relevant supplementary documents, such as technical reports and guidelines. This broader analysis highlights the challenges, opportunities, and regulatory gaps emphasizing areas that require further investigation.

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Posters

Mapping Italy's biodiversity: the molecular area of NBFC Platform

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Italian biodiversity is exceptionally rich and diverse, due to the country's unique geographical and eco-climatic features. Protecting and enhancing this natural heritage begins with accurate species identification, essential for applications in diagnostics, commerce, and forensics. DNA barcoding is a globally adopted tool for this purpose; however, Italy has lacked a coordinated national initiative until now. The National Biodiversity Future Center (NBFC) is addressing this gap by developing a platform for biodiversity research. The molecular division aims to create a reference library of DNA barcodes for over 4,000 samples of Italian flora and fauna, alongside a dedicated biobank.
This effort includes endemic, vulnerable, and ecologically significant taxa (e.g., pollinators), using specimens from herbaria, museums, fresh collections, and existing datasets.

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The platform has fostered extensive collaboration among research institutions across Italy, involving both data production and sample provision, thus building a strong national research network.
Thousands of sequences are currently being deposited, covering native and non-native plants (including invasive species), pollinating insects, birds, mayflies, and mosquitoes, achieving taxonomic coverage ranging from 50% to 90% depending on the group.
The project is also establishing links with major international initiatives such as iBOL and BIOSCAN, contributing data to global repositories like BOLD and GenBank, and aligning Italy's efforts with other European DNA barcoding projects.

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Posters

Injecting biodiversity in modelling of landslide phenomena and erosion processes

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Landslides and erosion processes are widespread phenomena causing damage to people and infrastructure throughout the Italian territory. Moreover, their impact can strongly influence biological ecosystems by introducing significant disturbances and affecting biodiversity. Accurate modelling of such processes is therefore crucial for risk assessment and landscape management.
Existing software for modelling these events integrates morphological data of the terrain, land use, soil characteristics, vegetation parameters, and meteorological factors to estimate the effects of rainfall on landslide initiation.
With this preliminary work, we explore how to better incorporate biodiversity-related information into LANDPLANER, a tool which stands out as a flexible, modular, and open-source raster-based model particularly valuable for its ability to operate with limited data. This work will also contribute to monitoring how biodiversity changes impact hillslope dynamics and processes.
Specifically, we set out to investigate the strategies to estimate the runoff curve number (CN) in different biodiverse conditions. The latter represents a crucial variable for determining the surface runoff and, consequently, the modelled processes, by considering more detailed information about the vegetation and the land cover.
This can be achieved by considering higher levels in the Corine Land Cover (CLC), or as in the case study of the Monte Pisano (Pisa, Italy), integrating more accurate estimation of the vegetation and the arboreal species.
Moreover, we would like to investigate the possibility of considering the dynamics of the vegetation and if finer estimations of other minor aspects, such as the Leaf Area Index or root parameters, can positively affect the model.

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Posters

The contribution of historical ecology to the dynamics of alpine biodiversity

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Reconstructing human-environment interactions of the last millennia is proving to be important in the context of biodiversity conservation and sustainable ecosystem management. However, identifying the drivers of environmental change is complex and limited by the availability of natural and historical archives. We analysed co-registered bio- and geoecological proxies, retrieved from two mires in Valmalenco (Italian Alps), located at the timberline and in the mountain belt, to infer the main environmental transformations that led to the current biodiversity setting.
At the timberline ecotone, Bronze Age primary vegetation was a mixed conifer forest dominated by Pinus cembra. Human impact increased during Early Iron Age with the development of mining activities and pastoralism. Local fires occurred in the Iron-Roman Ages; from 11th century onwards the primary forest collapsed, replaced by *Larix*, *Pinus mugo* and *Juniperus*. Since the Second World War, a new dynamic trajectory of canopy thickening and forest expansion was observed.
At the mountain belt, in the Late Roman Age, the primary vegetation was a mixed conifer forest dominated by *Abies alba* and *Picea excelsa*. Fire frequency increased during Early Middle Ages dry and warm phases, favouring *Alnus viridis* and *Larix*. *Abies alba*, nowadays eradicated from the Valmalenco watershed, withstood the local regime of low intensity surface fires for more than a millennium, from the Late Roman throughout the Early Middle Ages. *Larix, Alnus viridis* and *Fraxinus excelsior* abundance in modern vegetation is ascribed to intensified disturbance in the Early Modern Age, and to further woodland thickening after the Second World War.

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Posters

Identification of disease-related miRNAs as biomarkers using machine learning

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The application of Machine Learning (ML) methodologies in biomedical research has significantly enhanced our ability to identify complex patterns in biological datasets, improving disease diagnosis and prognosis. In this study, we explore the use of ML classifiers to analyze blood-derived microRNA (miRNA) expression profiles, aiming to identify both disease-specific and cross-condition miRNA signatures.
We implemented a multivariate ML classification framework to distinguish miRNAs associated with individual diseases from those linked to broader pathological processes. This approach facilitates the identification of biomarkers with diagnostic and therapeutic potential and contributes to a better understanding of disease mechanisms.
To illustrate the practical application of this framework, we analyzed two conditions from a public dataset: multiple sclerosis and colon cancer.
The preliminary results of Logistic Regression yielded F1 scores of 0.72 and 0.90 for multiple sclerosis and colon cancer, respectively, while the decision-tree model achieved F1 scores of 0.68 and 0.91 for the same diseases.
These results suggest that ML models can reveal complex patterns in miRNA expression data that are relevant to specific diseases. Our findings highlight the potential of ML in identifying disease-specific miRNA profiles, supporting the development of more accurate and personalized diagnostic tools.
This study underscores the central role of miRNAs in disease biology and lays the foundation for future research to validate these markers for clinical use. Further analyses are needed to assess the broader applicability of these findings in other disease contexts.

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Posters

The Italian endemic forest plants: leaf trait variation and divergence from widespread congeners

Cristina Gasperini[1,7], Andrea Coppi[2,7], Elisa Carrari[1], Roberto Canullo[3], Emmanuele Farris[4], Leonardo Rosati[5], Camilla Wellstein[6], Federico Selvi[1,7]

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Although endemic plant species are the most valuable component of the flora of a given region, our understanding of their biology, ecology and morpho-functional traits is still poor. Forest endemics of southern Europe are especially poorly known, hampering the implementation of the EU Biodiversity and Forest Strategy 2030, which places special attention on rare and threatened species. Accordingly, we developed the first checklist of vascular plants (134) only found in Italian forests and analysed leaf functional traits and ecological strategies across 45 selected endemics, either woody or herbaceous, from different regions and forest habitats. Including in the analysis 20 widespread congeners allowed to test the effect of the endemic condition on the magnitude and direction of leaf trait variation in 27 species pairs. Trait variability across the endemics was unexpectedly wide, especially in leaf area (LA) and leaf dry matter content (LDMC). Analysis of environmental factors revealed an overall significant influence of latitude, bioclimatic variables and ecoregion on trait variation. Plotting the 45 endemics in the trait space of the Global Spectrum (Phenospace) revealed relatively high levels of nitrogen content (Nmass) and their "acquisitive" position along the resource use gradient. However, species-pairs analysis showed that the endemic condition negatively affects LA and C:N ratio, while positively influencing leaf mass per area (LMA) and Nmass.

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This resulted in significant shifts also in the CSR ecological space, being the endemics characterized by a lower competitive ability and stress-tolerance and stronger ruderal component than in their widespread congeners.

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Posters

Marine and groundwater biodiversity assessment by genomic tools for high-resolution aquatic biodiversity monitoring

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Recent advances in genomic technologies offer opportunities for assessing biodiversity across aquatic ecosystems. The integration of cutting-edge genomic, transcriptomic, and eDNA metabarcoding approaches enables multi-level analyses of animal community composition and the evaluation of functional responses in marine and freshwater environments. Optimized DNA and RNA extraction protocols, high-throughput library construction, and next-generation sequencing are combined with bioinformatic pipelines to process and interpret large-scale data. In our studies, we utilize two approaches to assess variation in biodiversity as responses to different kinds of environmental pressures. Water eDNA metabarcoding achieves high-resolution detection of diverse taxa, including the early identification of non-indigenous species (NIS). As an example, a metabarcoding approach implemented on seawater samples, employing 18S rRNA and COI markers, provides complementary insights into local marine community structure by capturing a broad range of taxa identified at the genus-species level.

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Posters

Marine and groundwater biodiversity assessment by genomic tools for high-resolution aquatic biodiversity monitoring

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This approach not only enhances detection of native and vulnerable species but also reliably flags potential invasive ones, contributing to our understanding of species distributions and ecological dynamics in Mediterranean coastal zones, thereby informing conservation and management decisions. In groundwater species, gene expression patterns and genomic profiles contribute to reveal adaptations to the subterranean realm such as gene loss, selection, offering insight into regressive evolution and convergent traits. Whole genomes also enable the identification of detoxification pathways and pollutant biomarkers, supporting genomic ecotoxicology in groundwater organism. We think that both these approaches enhance biodiversity monitoring in both marine systems and groundwaters supporting strategic conservation efforts and helping environmental stress and resilience.

Posters

Salvia pratensis exhibits anti-cancer effects in triple-negative breast cancer through miR-34a-5p signalling

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Triple-negative breast cancer (TNBC) is the most common diagnosed malignancies in women, characterized by aggressiveness. Current treatments drastically impact on the patient's life quality and are still associated with a high risk of drug-resistance and relapse.
Recently, natural extracts have emerged as a promising therapeutic strategy with fewer side effects, either as standalone anti-cancer treatment or in combination with the conventional therapies. In this contexts, National Biodiversity Future Center aims to isolate Italian flora derived bioactive molecules and characterize their potential therapeutical properties.
Thus, MDA-MB-231 cells, a triple negative human epithelial cancer cell line, as well as MCF10A, human epithelial normal cell line, were stimulated for 24h and 48h with Petasites Paradoxus, *Salvia pratensis*, and *Typha Iaxmannii*. Importantly, *S. pratensis* selectively reduced MDA-MB-231 cell viability after 24 hours, without affecting MCF10A cell viability. It also impaired proliferation and migration, with a drastically increase of mitochondrial ROS production.
Underlying the molecular mechanisms, we observed a significant downregulation of genes associated with proliferation, stemness, apoptosis, inflammation, oxidative stress, as well as epithelial-mesenchymal transition markers after *S. pratensis* stimulation, compared to the control group. Importantly, over-representation analysis performed on these genes pool identified miR-34a-5p as potential regulator, with its low expression linked to poor TNBC prognosis. miR-34a-5p in treated MDA-MB-231 resulted significantly up-regulated compared to controls.

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Posters

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These findings suggest miR-34a-5p as a potential regulator of *S.pratensis* effects, highlighting the potential for further studies on natural bioactive molecules to pave the way for the development of novel and promising therapies.

Posters

Adaptation of the alien pathogen causing European ash dieback, *Hymenoscyphus fraxineus*, in the Italian peninsula: a threath to forest and urban biodiversity

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Common ash (*Fraxinus excelsior* L.) is a keystone species in European habitats, including alluvial forests that are in bad conservation status in most of the continent. The species is valued for wood production and urban greening, since it tolerates harsh environments, and captures pollutants from the air and soil. Common ash is suffering dieback and mortality due to the invasive fungal pathogen *Hymenoscyphus fraxineus*. Models of climatic suitability, based on the (now-exceeded) distribution range and low heat tolerance of fungal isolates in central Europe, predicted that southern Europe was at low risk of invasion. But the pathogen has spread southward reaching Mediterranean Europe. Currently, there is a gap of knowledge to be filled about *H. fraxineus* distribution in Italy. There is also an obvious gap of knowledge about phenotypic plasticity and adaptation of the pathogen to the thermal regimes of southern Europe. The aim of this work was to identify and characterize the populations of the pathogen along the Italian peninsula. Samples were collected from symptomatic common ash trees along the host specie's distribution. Fungal isolates were genetically characterised by sequencing at multiple loci. Plasticity response at adaptive traits were analysed under different thermal treatments to assess optimal range and thermal stress tolerance. Preliminary results clarify the possibility of further spread of the pathogen in the Mediterranean area and underscore the need to assess the risk posed by ash dieback to forest and urban biodiversity in the whole of Italy.

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Posters

Short-term urban aerosol exposure elicits redox and inflammatory pathway activation in bronchial epithelial cells

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Adverse health effects associated with particulate matter (PM) can occur even at concentrations below current regulatory limits, especially in urban environments affected by traffic. the underlying biological mechanisms driving these effects at low PM exposure levels remain poorly understood. This study investigates the molecular and cellular responses to fine particulate matter (PM_1) collected under specific meteorological conditions in an urban forest setting. Our focus was on gene pathways related to oxidative stress, inflammation, and epigenetic modulation through microRNAs.
In our research, we exposed human bronchial epithelial cells to the particles using a direct filter-contact model. Particulate samples were collected on six selected days in an urban park, each characterized by low PM mass concentrations (10 $\mu g \cdot m^{-3}$) and varying aerosol types
Our findings indicate exposure to low concentrations of PM_1 elicited a biphasic gene expression response The initial involved the activation of genes such as NRF2, NF-κB, CAT1, SOD1, HIF-1α, and HMOX1, while a secondary response involving TNF-α and GPX4. A strong association was observed between these biological effects and the chemical composition of the aerosols, particularly the ratio of fossil fuel-derived black carbon (BCff/BC), implicating fresh traffic emissions as key contributors.

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Additionally, it was observed a significant modulation of air pollution-associated microRNAs, suggesting an epigenetic dimension to the cellular stress response. These findings show that PM-induced biological effects depend more on aerosol composition and source than on mass concentration. They support evidence that health impacts can occur below regulatory PM levels and provide mechanistic insights into oxidative and epigenetic responses.

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Posters

Velella velella beached biomass: a potential source of bioactives compounds

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This study explores the sustainable valorization of *Velella velella* biomass, collected from beaches, for the extraction of high-value bioactive compounds, aligning with a circular economy approach. The research focused on astaxanthin, bioactive peptides, and chitin.

Astaxanthin extraction using natural deep eutectic solvents (NaDES) achieved comparable yields to conventional methods, with methanol-acetone yielding the highest recovery. Notably, the NaDES extract exhibited superior antioxidant activity.

Bioactive peptides, extracted from the residual biomass post-astaxanthin removal using pepsin, trypsin, or a combination, showed promising wound-healing potential in keratinocyte cell tests, with the combined enzymatic extract significantly enhancing healing compared to the control.

Chitin was isolated using both sodium hydroxide and NaDES. Its preliminary characterization via ATR-FTIR spectroscopy revealed a spectral profile similar to commercially available shrimp alpha-chitin.

These findings suggest beached *V. velella* biomass as a viable source for valuable compounds, promoting a circular economy. The study also highlights NaDES as a sustainable solvent and demonstrates the bioactivity of the extracted compounds, indicating potential applications across various industries.

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Posters

Genomic insights into postglacial expansion dynamics of an Italian endemic amphibian: *Bombina pachypus*

Leonardo Girlanda[1,2], Alessio Iannucci[1], Roberto Biello[3], Daniele Canestrelli[4], Andrea Chiocchio[4], Claudio Ciofi[1], Emiliano Trucchi[5], Giorgio Bertorelle[3]

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Geographic range expansion affects population dynamics and shapes biodiversity distribution. Dispersion and colonization of new habitats may lead to genetic diversification as populations adapt to environmental changes. In this study, we investigate genomic variation resulting from postglacial expansion in the Italian Apennine yellow-bellied toad (*Bombina pachypus*). Like many amphibians, *B. pachypus* has a large (10 Gb) and complex genome. We aim to assess genetic diversity and genetic load by targeting 24 Mb of genomic regions, including high-effect and low-effect genes, regulatory sequences and neutral intergenic areas. These regions were selected using open chromatin sequencing (ATAC-seq) and mRNA sequencing. Custom probes will be designed to capture target sequences from approximately 200 wild toads sampled across the species' range. We will estimate genetic diversity and gradients of genetic load along the expansion route. Signatures of natural selection will be inferred by detecting positive selection in stable southern populations and tracking shifts in fitness peaks at the range front. Currently, we are finalizing the capture probe design. The next phase will involve sequencing the selected regions and conducting population genomics analyses.

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Posters

Modeling complex abiotic–biotic relationships through multilevel data integration: the case study of the Ombrone River catchment (GR, Central Italy)

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Non-living and living nature are inherently connected. Variation in geology, topography, geomorphology, and hydrology defines the geodiversity that creates and sustains niche spaces promoting biodiversity. Recent scientific observations support this link, showing a positive influence of geodiversity on biodiversity across various environments and spatial scales. However, empirical studies exploring these relations remain limited, despite their relevance in addressing global challenges such as declining diversity due to climate change. River catchments are crucial for this geo-bio co-dependence, acting as "conveyor belts" for the transport of water, energy, sediment, and nutrients.

In this research, we aim to explore the complex interconnections and causal relationships among catchment features, river biotic, and abiotic characteristics. The Ombrone River Basin (Grosseto, southern Tuscany) has been selected as a pilot area due to its lithological heterogeneity, the presence of abandoned mining sites, and protected natural areas. A multi-medium and multi-parameter sampling and analytical approach was employed to characterize the chemical composition of river waters, stream sediments, and suspended solids in terms of major, minor, trace elements, heavy metals, and nutrients, also accounting for seasonal variability. River biota is assessed through cytometry and microbial gene markers analysis on selected samples. The obtained data are analyzed using geochemical and hydrological modeling, and advanced statistical methods (e.g., Compositional Data Analysis) to characterize catchment geodiversity, feedback dynamics with biota, and potential regime shifts. The results aim to support monitoring strategies and predictive models for biodiversity resilience and conservation.

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Posters

The Geoportal for Italian marine biodiversity

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The National Biodiversity Future Centre (NBFC) aims to integrate and harmonize knowledge of Italian marine biodiversity and document marine monitoring activities, promoting the adoption of innovative, cost-effective methodologies and technologies.
The Geoportal for marine biodiversity in Italy integrates data from institutions, national and international programs, scientific literature, and public marine data portals. It is available through the Biodiversity Gateway enhancing integration between science, policy, and the public, with the ultimate goal of improving the conservation, restoration, and valorization of marine biodiversity. The Geoportal is free accessible via web allowing users to visualize and access data in a systematic and standardized way. Scientists and local administrator have the opportunity to capitalize on this information fostering the achievement of biodiversity targets and the implementation of maritime spatial plans in Italy.
Today, the Geoportal hosts 109 marine pilot sites and more than 60 thematic layers including on-going and past monitoring activities, human uses, biodiversity, and geodiversity in Italian waters. The challenge is harmonizing and integrate information ranging from all kingdoms (from cetaceans to bacteria) and of different data types such as pictures, videos, tables, graphical representation, biodiversity inventories, spatial data and time series. Each element on the map is linked to the relative metadata record reporting data history and source, data access and reuse policies, point of contacts, and when available the link for data sharing. The architecture is designed to fit all standards and best practices for data collection, integration, and shareability, following the FAIR principles (Findability, Accessibility, Interoperability, Reusability).

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Posters

Social behaviour of the red swallowtail perch *Anthias anthias* (Linnaeus, 1758) (Perciformes: Anthiadidae)

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Anthias anthias (Linnaeus, 1758), commonly known as the swallowtail perch, is a widely distributed species in the Mediterranean Sea, typically associated with coralligenous formations. Despite its abundance, scientific studies on this species remain limited. *A. anthias* is known to be a protogynous hermaphrodite, and it has long been presumed to exhibit a haremic social structure. This assumption likely arises from its classification within the family Anthiadidae, whose members share key characteristics, including protogyny, small body size, gregarious behaviour, and, in some cases, harem formation. However, empirical evidence directly supporting these aspects of *A. anthias*' reproductive and social behaviour remains scarce, highlighting the need for further research to clarify its social organisation. This study aimed to investigate the social behaviour of *A. anthias* by analysing the sex ratio within groups and conducting morphometric assessments to identify potential sexual dimorphism. These analyses not only provide essential insights into the species' social structure and reproductive strategies, but also allow for monitoring its abundance and group formation patterns, helping to shed light on a species that is as familiar as it is poorly understood.

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Posters

Thermal stress and oxygen consumption rhythms in the invasive blue crab *Callinectes sapidus*: effects of daily environmental fluctuations in the Venice Lagoon

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The blue crab *Callinectes sapidus* settled in the Venice Lagoon in the last century but only recently became invasive. To understand its impact on local biodiversity and ecosystem services, such as fishery and aquaculture production, it is crucial to investigate the eco-physiological responses that support its success. This study compares mortality and heart rate responses to increasing temperature, as well as circadian oxygen consumption rhythms in this species, following two acclimation treatments: one reflecting the natural seasonal fluctuations of temperature and dissolved oxygen in the Lagoon, and one with constant conditions corresponding to the average values recorded during the natural treatment. Results show that acclimation significantly affects the species' physiological responses. Natural acclimation increases stress resilience, raising the lethal temperature by about 1.5°C. for 50% of individuals (LT50) compared to constant conditions. Q10 values suggest that the absence of environmental variability limits the heart's ability to respond efficiently to rising temperatures. Additionally, the circadian rhythm of oxygen consumption is influenced by acclimation, indicating that natural environmental fluctuations may trigger proactive physiological adjustments. These findings give valuable insights into the costs and benefits of daily environmental fluctuations in productive aquatic ecosystems and highlight their role in shaping resilience in invasive species under climate change.

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Posters

Assessment of microarthropodological bioindicators among and beyond the timberline in Parco Regionale del Frignano (Northern Apennines, Italy)

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Soil biodiversity is crucial for ecosystem functioning, especially in fragile high-altitude environments. Microarthropods are effective bioindicators of soil quality due to their sensitivity to environmental changes. We investigated microarthropod communities across the timberline in "Parco del Frignano" (Emilia Romagna) to explore pedobiodiversity in alpine habitats. The results will be included in the Biodiversity Between the Roots project, a 3PP-NBFC of the "Ente Parchi Emilia Centrale". Soils were collected four sampling localities presenting various habitats (1300–2000 m a.s.l.): forests, pastures, and Vaccinium heathlands. During three field campaigns (2024–2025), 30 stations will be sampled thrice using a standardized protocol ensuring extractions and downstream analyses consistency. Microarthropods were extracted from soil-cores using Tullgren-Berlese funnels. Environmental metadata (GPS, altitude, vegetation, temperature, humidity) were recorded. Soil biological quality was evaluated using the QBS-ar index and Hill's diversity indexes, with statistical analyses (variance, PCA). Selected specimens were preserved for museum reference, DNA analyses, and educational purposes.

Two of the three sampling campaigns have already been completed. Preliminary data reveal a general depauperating effect of Vaccinium on biodiversity, while the presence of forests increased QBS-ar indexes but reduced the diversity indexes, the microarthropod communities appear less dominated in pastures. The combination of QBS-ar and Hill's numbers revealed complementary insights into the soil ecosystem's status.

Project funded under NRRP, Mission 4 Component 2 Investment 1.4 funded by NextGenerationEU; Project code CN_00000033, Project title NBFC

Posters

Assessment of soft bottom ecosystems with special focus on bioturbators species and their effects on sedimentary processes in La Spezia and Castellammare gulfs

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The biodiversity of soft-bottom macrozoobenthic communities inhabiting the continental shelf is significantly affected by anthropogenic impacts (commercial/recreational shipping, fishing (trawling)/aquaculture) that disrupt their equilibrium. Benthic communities promptly respond to these changes by altering species composition and assemblages' structures. Correlating these responses with environmental variables (e.g. grain size, sedimentation rate) allows for the identification of the main disturbance factors. Here we aim to assess soft-bottom ecosystems, focusing on bioturbator species as indicators of natural and anthropogenic disturbances in the surface mixed sediment layer. Samples will be collected using a Van Veen grab from impacted sites (within La Spezia and Castellammare Gulfs, respectively Liguria and Sicily) and unimpacted sites (outside the gulfs) for stereomicroscopic analysis of the biotic component and granulometric assessment via sieving. Sediment cores will also be collected through a gravity corer to evaluate the level of anthropogenic disturbance through Gamma spectrometry and laser diffractometry. Data analysis will include biodiversity indices, multivariate analyses to identify benthic assemblages and their relationship with environmental variables, and the study of bioturbator communities. Gamma spectrometry and laser diffractometry will provide information on sedimentary processes. Expected outcomes include the identification of key anthropogenic stressors, quantification of biodiversity loss, understanding the role of environmental factors, and evaluation of the effectiveness of bioturbator species as disturbance indicators. The study will provide crucial baseline data for the management and conservation of soft-bottom ecosystems.

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Posters

A stable GH31 α-glucosidase as a model system for the study of mutations leading to human glycogen storage disease type II

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GH31 glycosidases are widespread across organisms, but, remarkably, less than 1% have been biochemically characterized to date. Among them, human lysosomal acid α-glucosidase (GAA) is notable due to its link to Pompe disease, a rare lysosomal storage disorder caused by its deficiency [1]. This disease results in glycogen accumulation, severe cellular damage, motor impairment, and premature death. Structural and functional studies of GAA mutants are challenging due to their instability and lack of activity, hindering their expression and purification. Here, we explore MalA, a GH31 enzyme from the hyperthermophilic archaeon *Saccharolobus solfataricus*, isolated from the Pisciarelli geothermal pool, as a stable homolog of GAA. This work exemplifies the valorization of unique biodiversity, harnessing the properties of an extremophile enzyme for biomedical research. MalA is highly expressible, easy to purify, and structurally characterized [2]. The R400H mutant in MalA, corresponding to the pathogenic GAA R600H mutation, revealed a 1200-fold drop in specificity constant and a 8 °C reduction in thermal stability. We report on MalA as a robust model for studying GAA mutations and developing therapeutic chaperones [3].

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Posters

A jewel of mediterranean biodiversity and geodiversity: the Linosa Island

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In this work, we present recent studies that highlight the unique characteristics of Linosa Island, emphasizing its exceptional biodiversity and geodiversity, which are intricately linked to its volcanic and morphological features. Linosa, a volcanic island in the Sicilian Channel, has been the focus of extensive seafloor surveys over the past decade, incorporating geophysical data, ground truthing, sampling, and ROV investigations (Tonielli et al., 2019). Three main habitats have been identified as dominant in Linosa's marine environment: *Posidonia oceanica* meadows, rhodolith beds, and coralligenous habitats, including expansive coral forests. Furthermore, the assemblages of benthic foraminifera, which serve as valuable environmental indicators, have been studied here for the first time to explore their correlation with the seafloor's topography (Ferraro et al., 2020). The integrated dataset from these studies has been used to produce a detailed map of the seafloor at a 1:15,000 scale, with the aim of emphasizing the island's remarkable marine biodiversity (Innangi et al., 2024).

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Posters

Lake Maggiore – a melting pot of invasive crayfish and microbiotic coexistence

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A multi-year monitoring of the subalpine Lake Maggiore revealed well-established populations of three invasive crayfish: *Faxonius limosus, Pacifastacus leniusculus*, and *Procambarus clarkii*, altogether listed as species of Union concern (EU 1143/2014). Being keystone species and bioindicators of good/polluted conditions in freshwater ecosystems, crayfish showed peculiar interactions since they coexist in the same area. Worldwide, little is known of the effects of multispecies co-occurrence on their spread, diet and behaviours, concomitant with still limited studies on the role of their microbiota in the invasion success. We present the distribution of the three species, their morphological traits variability and age/sex ratio in the lake in 2022-2024. The study was performed within the frame of National Biodiversity Future Center (NBFC) and International Commission for the Protection of Italian-Swiss Waters (CIPAIS). In addition, crayfish microbiota was analysed by species, size, and sex. The results revealed a distinctive composition of microbiota for each species, without significant differences between sexes and body size. On the contrary, the microbiota of *P. leniusculus* differed from that of the other two species. Whereas *F. limosus* and *P. clarkii* microbiota composition was dominated by bacteria commonly found in invertebrate guts, the most common genera in *P. leniusculus* were Shewanella, Lactobacillus and Enterococcus, typical of human and other mammal guts. Understanding the dynamics of multispecies coexistence and of their microbiota interactions can offer not only insights into the species potential to successfully invade an area, but also into elucidating the ecological role of crayfish co-occurrence in the littoral ecosystem processes.

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Posters

"RiViVe" - Perspectives for rethinking biodiversity in a transdisciplinary and collaborative way

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We present here RiViVe, an educational project designed within the Italian NFBC - National Biodiversity Future Centre to address the challenges related to the loss of biodiversity and to its valorisation in a transdisciplinary and collaborative way.
Through multidimensional approaches, RiViVe involves a group of artists, ecologists, anthropologists, social scientists and environmental humanities in the co-creation of an educational path addressed to participants interested in biodiversity (for research, education, public communication, management, etc.) aiming at improving their ability to interact with different audiences, disciplines and knowledge.
Within RiViVe, the connection between humans and the lands they inhabit is crucial, as well as the exchange of different forms of knowledge and wisdom between people who live in the same area and experience diverse aspects of the same land.
During a Residential laboratory open to participants, the most current issues regarding the diversity of human and other than human living beings - on a theoretical and practical level – will be addressed, such as taxonomy and biodiversity monitoring and evaluating practices.
The aim is to inspire new visions and trajectories of research and action in the younger generations and in all those who deal with biodiversity issues in various roles, and to develop skills necessary to operate as " agents of change".

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Posters

Park age shapes ecosystem services in urban lawns

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According to estimates, nearly 70% of the world's population will live in urban environments by 2050. Urban green spaces are essential elements of modern cities, providing numerous ecosystem services. To understand how soil characteristics and different layers of biodiversity (vegetation, arthropods and microbes) have an impact on ecosystem services, we sampled and analysed soils from urban lawns in five major Italian cities along a latitudinal gradient (Turin, Milan, Florence, Rome, Naples), in parallel to adjacent less disturbed areas as control.
Our results indicate that the multifunctionality (i.e. the average of ecosystem services considered) of urban park lawns is lower than that of less disturbed areas. However, the number of ecosystem services that reach at least 75% functionality is the same for historical lawns and control areas, which means that in the long run, park lawns tend to increase ecosystem services. In particular, decomposition of organic matter is lower in urban parks, while no differences were observed in terms of nutrient availability or plant symbiotic associations. Notably, the number of fungal pathogens is higher in recent lawns than in historical ones. The use of a structural equation model reveals that both age of the park and percentage of clay have a positive direct effect on multifunctionality in urban lawns. Latitude and mean annual precipitation also have a weak indirect influence on multifunctionality. Overall, these data improve our understanding of ecosystem services provided by biodiversity in urban green spaces, paving the way for designing healthier and more sustainable cities.

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Posters

Biorefinery on mixed lignocellulosic feedstocks – a step towards valorization of mixed forestry residues for fostering biodiversity and forest resilience

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Isolation of the three main polymers that constitute lignocellulosic biomasses is still challenging due to the complexity of the natural material and its chemical recalcitrance.
In our ongoing efforts to improve biorefinery methods and to understand the implications of the process on structural features that determine downstream usefulness of the isolated polymers, we investigated a novel approach that involved mixed lignocellulosic starting materials in an organosolv processing. Till now, biorefineries used single types of biomass, i.e., only softwoods, hardwoods, or herbaceous plants. The reason for this lies in the already complex chemistries happening during biorefinery processes, and the understanding of product formation. Yet, such an approach is ultimately favoring monocultures in forestry, with drastic consequences for biodiversity and biological resilience of ecosystems. Yet, forestry monocultures are also a risk in light of the climate change that is increasingly affecting forests, necessitating the exchange of industrial forest monocultures into mixed soft- and hardwood forests. Such mixed forests will deliver, however, mixed biomasses for biorefineries.
In our study, we used fir wood as standard softwood together with different hardwoods from various oaks to understand the effects in an ethanol-based biorefinery approach suitable for the valorization of mixed forestry products and wastes. Most interestingly, our results indicate a beneficial effect in terms of biomass fractionation, yielding high quality fractions of cellulose, hemicellulose and lignin. Separated fractions were fully analyzed according to the state-of-the-art. The truly novel isolated structural polymers represent valuable starting materials for the generation of innovative applications.

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Posters

Impact of environment in Multiple Sclerosis progression: circulating microRNAs as biomarkers for disease monitoring

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Multiple sclerosis (MS) is a chronic immune-mediated inflammatory disease of the central nervous system (CNS). It is one of the most common cause of neurological disability in young adults globally, in which each patient could display a variety of symptoms depending on the area of the CNS affected. The underlying causes of MS are still not clear, but it is believed that an interplay between different genetic and environmental factors may have a significant role in increasing the inflammation levels, causing the onset of the pathology.
Indeed, it is reported that exposome, included air pollution, diet, smoking and the exposition to the sun could increase inflammation, and impact in the development and exacerbation of MS. Our aim is to study differential expression of circulating miRNAs related to oxidative stress and inflammation response. The association between miRNA and pollution will be analysed in order to propose novel biomarkers in different disease stages.
Specifically, using bioinformatics analysis on different open-access databases, we selected 5 miRNAs deemed to be the best representative of inflammation and oxidative stress response: miRNA-30a, miRNA-146a, miRNA-330, miRNA-574-3p and miRNA-664. The plasma and serum samples derived from a cohort of 115 patients were collected around the Pavia area (Mondino hospital). RNA was extracted and the level of the selected miRNAs were quantified using the RT-PCR.
Our ultimate goal is to propose a panel of circulating miRNAs as non-invasive biomarkers for assessing environment-related inflammation and monitoring disease symptoms in patients.

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Posters

Combating the threat: innovative antibiofilm strategies against *Vibrio crassostreae* to protect sea urchin aquaculture

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The biofilm of *Vibrio crassostreae* poses a significant threat to the aquaculture of sea urchins, particularly Paracentrotus lividus, where infections can trigger mass mortality events. The economic and ecological importance of *P. lividus* is substantial: it plays a vital role in marine ecosystems, enhancing biodiversity and coastal habitat health, while also holding significant value in aquaculture and culinary markets. Consequently, the decline of *P. lividus* populations due to pathogenic infections could have far-reaching consequences, threatening local economies and disrupting ecological balance.

This study aims to characterize the in vitro formation of *V. crassostreae* biofilms and develop innovative antibiofilm strategies. To elucidate how environmental factors influence bacterial proliferation, we investigated in vitro biofilm development under various conditions. This includes temperature, salinity, nutrient availability, and adhesion surfaces, utilizing both abiotic surfaces like glass and polystyrene and biotic-like surfaces such as chitosan films mimicking sea urchin spines.

In parallel, we are screening Antarctic-derived antibiofilm molecules as potential agents against *V. crassostreae* infections. Sourced from Antarctic bacteria renowned for their ability to produce unique bioactive compounds, our library includes both pure compounds and organic extracts from bacterial cultures. These have been rigorously tested for their efficacy in preventing *V. crassostreae* biofilm. Among our findings, some promising molecules have emerged, notably pentadecanoic acid. These discoveries could pave the way for effective management strategies against *V. crassostreae* infections, ultimately safeguarding marine biodiversity and sea urchin aquaculture sustainability.

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Posters

Biomonitoring of growth and physiological conditions of gilthead seabream *Sparus aurata* farmed in an open sea farm in the Ligurian Sea

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The project aims at monitoring growth and physiological conditions of aquacultured marine fish from an offshore farm by a multibiomarker approach to evaluate stress conditions and develop welfare indicators.
Data are presented on gilthead seabream (*Sparus aurata*) from the open sea farm Aqua s.r.l. (Lavagna, Ligurian Sea), grown in the absence of antibiotics. Fish were fed a standard commercial diet. A total of 15 samplings were carried out from May 2023 (1-2 months old fry) to March 2025 (marketable size animals).
A set of biomarkers, at individual, tissue and molecular level, were evaluated, in particular those related to growth and sexual maturation, tissue histopathology, enzymatic biomarkers. Morphometric and biometric parameters (length, weight, HIS and K factor, as well as specific growth rate –SGR in relation to water temperature) were measured. Enzymatic biomarkers of oxidative stress and biotransformation (catalase, GSH transferase and ethoxyresorufin-O-deethylase EROD) were evaluated both in liver and gills as well as histopathology. Other tissues were sampled for further analyses, such as intestine, for evaluation of the gut microbiota composition along growth.
Overall, the results obtained so far indicate a good health condition of fish along with growth, providing first background information on farmed S. aurata. These data can be utilized as well as a feedback loop that will help understanding the conditions for maintenance and improvement of health and welfare of farmed fish through zero chemical tools. These activities will represent a first step forward in knowledge on sustainable aquaculture of marine fish in Italy.

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Posters

Methodological challenges in monitoring biodiversity of Mediterranean gelatinous zooplankton

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Current national marine monitoring programs primarily assess zooplankton biodiversity based on crustacean taxa, particularly copepods, which constitute the dominant component of the mesozooplankton standing stock.
In recent years, the increasing occurrence of high abundance of gelatinous zooplankton, such as cnidarian jellyfish, has drawn worldwide attention, primarily due to the detrimental effects that jellyfish swarms can have on fisheries, aquaculture, and tourism. Cnidarians, along with other gelatinous zooplankton such as ctenophores and pelagic tunicates (including larvaceans, salps, pyrosomes, and doliolids), are composed by 95-99% water, making them extremely fragile and difficult to collect and preserve in good conditions for taxonomic assignment. Moreover, species-level identification of gelatinous zooplankton is challenging, partly due to the scarcity of expert taxonomists. As a result, gelatinous zooplankton communities remain under-researched.
In this study, we investigate the current diversity of gelatinous zooplankton in the Gulf of Naples, an area where this group has significantly increased in recent years. In parallel, we assess the performance of protocols traditionally implemented for zooplankton monitoring, and propose methodological guidelines to optimize both morphological and molecular identification of gelatinous zooplankton.
Our aim is to contribute to the enhancement of current monitoring capabilities by improving the quality of gelatinous zooplankton observations. This, in turn, would enable more accurate assessments of their impacts in marine ecosystems and foster a better understanding on the possible causes and consequences associated with the observed rise of gelatinous zooplankton stocks.

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Posters

Would you trust living in a house designed by a dog? Hypotheses and reflections on the concept of 'den'

Letizia Luini[1], Greta Persico[1], Students and Teachers from IV A[2], Andrea Galimberti[1], Monica Guerra[1], Rosa Buonanno[3], Francesca Rota[1], Angela Rinaldi[1], Angela Sangalli[1]

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The poster describes an educational experience involving fourth-grade students exploring the concept of 'den' through direct observation, exploration, and reflective discussions.
As part of the BEAT research group's initiatives within the NBFC project, two fourth-grade classrooms from Istituto Comprensivo Pertini in Milano have been participating, since November 2024, in weekly explorations of urban green areas - specifically Parco Nord and Vivaio Bicocca. The applied methodology is experiential, reflective, and dialogical, aiming at helping children to engage deeply with elements of biodiversity in outdoor contexts.
In particular, class IV A focused around the element 'den', after observing a bramble bush in Parco Nord: one child described it as a den "because the trunk formed a roof, two branches acted like a door,[...], filled with leaves, seemed large enough for a fox". This observation sparked interest among the group and led to extended reflections. In the weeks, children continued their investigations in the Vivaio, posing increasingly complex questions: What makes a space a den? Can it be man-made? Is it safe? They compared animal-built shelters with human-constructed ones, like birdhouses, and reflected on the idea of trust and suitability, wondering: "would you trust living in a house designed by a dog?". Others are assuming that a den is not just a physical structure but a personal and contextual space, inferring that potentially any place offering safety and comfort could be a den. highlighting how, from their point of view, all the elements of a context are in deep connection with each other.

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Posters

Is the snail an insect? Learning and valuing biodiversity through an explorative and questioning approach

Greta Persico[1], Letizia Luini[1], Students and Teachers from class IV A[2], Andrea Galimberti[1], Monica Guerra[1], Rosa Buonanno[3], Francesca Rota[1], Angela Rinaldi[1], Angela Sangalli[1]

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This poster shows the history of a compelling question.
The curiosity of primary IV pupils arose from explorations carried out in close areas, such as Parco Nord and Vivaio-Bicocca (Milan), while using the Biodiversity Education Toolkit developed by the BEAT research group based on experiential, reflective and dialogical learning processes.
Are snails insects? If not, why? And what about spiders?
A research question that gave rise to others. Children formulated hypotheses and developed arguments, broadening the field of investigation to analyze distinctive elements of insects, such as conformation and characteristics of different parts of the body, the way they move, the methods of feeding and reproduction, the life stages, the perceived danger to humans, and so on.
In addition to direct and continuous observation, they used comparisons between different specimens, dialogue with NBFC researchers, and the design of a tool to synthesise the results obtained in order to explore paths of investigation and possible answers.
They share knowledge and doubts, they validate and discard hypotheses, reasoning together as a scientific community.
Curiosity about the insect's world was the driving force behind the learning process, similar to a naturalistic investigation. This attitude fostered children willing to interact deeply with biodiversity's elements in an outdoor context, promoting a relational posture with those. The poster therefore presents, as an example, one of the many research and learning topics deepened by the students of Class IV B of the Pertini Comprehensive School in Milan with the researchers of the NBFC, from November 2024.

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Posters

Making visible outdoor learning: multimodal documentation in primary school biodiversity education

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The documentation processes appear crucial when educational experiences take place outdoors, since richness and unpredictability provide infinite possibilities for discovery, exploration and learning (Guerra, 2020). In biodiversity education (Persico, 2024), making visible the encounter with places through multimodal documentary practices (Guerra; Luini, 2024), allows to keep track of questions, hypotheses and first discoveries, increasing deep connection with environments.

This poster presents findings from a six-month study involving 37 fourth-grade primary school students and their teachers. Within the NBFC framework, the BEAT research group is integrating into the school routine a methodological approach that supports children's continuous and contextualized exploration of nearby outdoor spaces (e.g., gardens, parks), connected to curricular learning. Documenting processes and interactions with biodiverse settings is a peculiar aspect of the methodological proposal: each child has a personal naturalistic notebook and is invited to keep track of attention-grabbing elements through different tools. Graphic representations, maps, symbols, narrative descriptions, photographic documentations, even combined with each other, allow to trace, re-cross and re-signify, both individually and collectively, the observational and exploratory processes activated.

Making element's characteristics visible through different tools stimulates inquiry-based thinking by revealing hidden contextual elements, mapping their relationships, and fostering a scientific mindset oriented toward exploration and hypothesis-building rather than relying on ready-made answers. Direct observation promotes attention to details, allowing us to distinguish individual elements and species. Moreover, sharing questions and hypotheses drawn from the documentation with peers, allows groups and teachers to further deepen their experiences and disciplinary investigations, starting from children's personal considerations.

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Posters

Children and the sea: exploring marine biodiversity through young eyes

Francesco Paolo Mancuso[1,2], Dafne Mancuso[3], Mar Bosch-Belmar[1,2], Jairo Castro-Gutiérrez[1], Maria Giovanna Stoppani[1,2], Gianluca Sarà[1,2]

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Children's drawings can offer a valuable lens through which to explore early perceptions of marine biodiversity and environmental awareness. This ongoing research project aims to investigate how the sea and its lifeforms are represented in visual artworks created by children, with the goal of identifying recurring themes, symbolic elements, and potential indicators of ecological understanding. A collection of drawings is currently being assembled from publicly accessible online sources, including educational websites, social media, and digital galleries. The images will be analyzed through a mixed-methods approach, combining qualitative content analysis with basic digital image classification, to examine elements such as the types of organisms depicted, the use of color, emotional tone, and the presence of anthropogenic features like pollution or boats. Although the analysis is still in progress, preliminary observations suggest a strong emphasis on certain iconic species and a frequent interplay between positive and alarming imagery. This study seeks to contribute to a broader understanding of how children conceptualize the marine environment and to explore the potential of creative expression as a tool for environmental education and engagement. By interpreting these visual narratives, we hope to gain insights into the early development of marine consciousness and its implications for future conservation attitudes.

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Posters

From by-products to bioactives: circular strategies for marine resource valorisation

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The blue bioeconomy aims to minimise environmental impacts while enhancing the economic potential of marine resources through ecosystem conservation, waste reduction and circular production models. This approach is critical to addressing challenges such as overfishing and waste in the marine sector, ensuring the health of ecosystems and the long-term sustainable management of resources. A key approach is the valorisation of underutilised fish species and by-products of fish processing, which promotes waste minimisation, fish supply diversification and circularity in marine sector.

Fish species with low commercial value but high nutritional content offer promising opportunities for the development of functional marine-derived ingredients with health-promoting properties. Our research group has demonstrated the feasibility of producing such ingredients through nutritional and functional characterisation, combined with green extraction methods, enzymatic hydrolysis and other sustainable technologies. These efforts contribute to the sustainability of the fisheries value chain, support biodiversity conservation and promote public health.

Our group has developed significant expertise in implementing these processes for the sustainable valorisation of unconventional marine biomass, through national and international projects such as NBFC, Engage4BIO, and BlueRev. We have developed Technology Readiness Level (TRL) protocols for the extraction of bioactive compounds such as omega-3 enriched fish oil, astaxanthin, protein hydrolysates, polyphenols and carotenoids. These compounds have high potential in the food, feed, pharmaceutical and cosmeceutical sectors.

Our activities demonstrate the scalability and replicability of circular blue innovations and highlight their alignment with the United Nations 2030 Sustainable Development Goals (SDGs), contributing to sustainable economic growth, environmental protection, and social inclusion.

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Posters

Production of high-value bioactive compounds from by-products of an invasive species: the case study of protein hydrolysates from *Callinectes sapidus* by-products

Michelle Marchan Gonzalez[1], Rosaria Arena[1], Simona Manuguerra[1], Salomé Huot[2,3], Carlotta Giromini[4], Frédéric Debeaufort[5], Andrea Santulli[1], Concetta Maria Messina[1,2]

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It is well known from research that the invasive blue crab (*Callinectes sapidus*) is impacting Mediterranean ecosystems. A key promising opportunity is its processing in the food sector, which produces a significant amount of by-product, rich in valuable bioactive compounds, useful for many industrial applications. Blue crab by-products (BCBP) are a valuable source of chitin, astaxanthin, n-3 PUFAs and proteins.
In particular, BCBP contain high-quality proteins that can be further valorised. This study focuses on the production of protein hydrolysates (PH) through enzymatic hydrolysis, an environmentally friendly method. It employs commercial proteases following a standardised protocol, resulting in PH with a high degree of hydrolysis (DH% 10%). DH% is a key parameter, and a value above 10% indicates greater peptide production in solution, improved protein solubility, and the potential for protein recovery for use as a food additive. Additionally, in vitro assays showed significant antioxidant activity, including dose-dependent DPPH radical scavenging and ferric iron reduction in the reducing power assay. These hydrolysates are potentially functional ingredients in the nutraceutical, food, and cosmetic sectors. Future research will assess their protective effects against oxidative stress in cellular models.

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This research demonstrates that extracting valuable compounds from BCBP provides a sustainable solution for the food industry by optimising resource use and minimising waste through circular economy practices.

Posters

Proforestation and biodiversity: effects of forest management abandonment on tree-related microhabitats

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Proforestation is increasingly recognized as an effective strategy for biodiversity conservation. The abandonment of forest management allows trees to grow and deadwood to accumulate, leading to a more complex forest structure. This increased complexity enhances habitat heterogeneity, which can support a higher biodiversity. In this context, our study aims to test the effect of forest management abandonment on tree-related microhabitats (hereafter TreMs), widely recognized as key indicators for biodiversity. We selected three study areas: two located in Alpine forests (one inner-Alpine and one outer-Alpine) and one located in a Mediterranean forest. In each area, we identified three forest stands with different management histories: one actively managed, a second where the latest management intervention was more than 30 years ago, and a third abandoned for at least 60 years. In each stand, we established nine plots where we collected dendrometric and TreMs data. We found a positive effect of proforestation on TreMs density, particularly on TreMs associated with deadwood presence. Additionally, we observed a positive influence of proforestation on the overall TreMs richness, although this effect was site-specific and emerged significantly at only the inner-Alpine site. Our findings contribute to understanding the ecological implications of forest management abandonment and its potential role in biodiversity conservation.

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Posters

Assessing climate change impacts on holm oak forest combining Copernicus data and high- resolution satellite imagery on Mediterranean areas

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Climate change is a major threat to global biodiversity, especially in drought-prone regions such as the Mediterranean. Alterations in the intensity, frequency, and duration of droughts and heatwaves have caused significant spatio-temporal variability in the hydrological cycle, directly affecting ecosystem functioning. In recent decades, unprecedented drought events and increasing tree mortality have been recorded across Mediterranean forests. Among these, holm oak forests (*Quercus ilex* L.), a key Mediterranean ecosystem, have experienced notable productivity losses and, in some cases, high mortality due to prolonged summer droughts.

This study assesses the impact of summer droughts on the productivity and mortality of holm oak forests in Sardinia (Italy) by integrating Sentinel-2 multispectral satellite data, very high-resolution PlanetScope imagery, and meteorological data from the ERA5 reanalysis. Our findings reveal a marked decrease in summer precipitation and a 2–4 °C increase in summer temperatures in Sardinia over recent decades, compared to the 1971–2000 climate baseline. Differences in summer NDVI values between 2022 and 2024, confirmed through visual inspection of PlanetScope imagery, enabled the accurate identification of drought-impacted holm oak stands.

Observed productivity declines and mortality patterns were strongly correlated with intensified climate anomalies. The integration of remote sensing and climate data proved effective in detecting early signals of ecosystem stress. This approach offers a valuable tool for forest monitoring and management under climate change, enhancing the capacity for early intervention and adaptive strategies in Mediterranean holm oak forests.

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Posters

Unveiling impacts of *Robinia pseudoacacia* and *Prunus serotina* invasions in temperate forest ecosystems in Central Europe using multitemporal satellite data

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Biological invasions significantly alter ecosystem composition, structure, and functioning, necessitating monitoring across spatial and temporal scales. Satellite remote sensing, with its continuous data acquisition, enables the assessment of invasive non-native tree impacts. This study employs monthly multispectral Sentinel-2 and radar Sentinel-1 imagery to evaluate the effects of *Robinia pseudoacacia* and *Prunus serotina* on productivity, photosynthetic efficiency, and canopy structure in Central European forests (Poland). We analyzed two forest habitats: nutrient-rich oak forests (*Quercus robur, Q. petraea*) and nutrient-poor Scots pine forests (*Pinus sylvestris*). A total of 160 study plots (0.05 ha) were established, comprising 64 plots invaded by *R. pseudoacacia*, 64 by *P. serotina*, and 32 non-invaded controls. Field measurements included tree diameter, basal area, and non-native tree dominance. Spectral metrics derived from satellite imagery were used to assess forest productivity, photosynthetic efficiency, and canopy structure. Differences between invaded and non-invaded forests were analyzed using linear mixed models (LMMs), ANOVA, and Estimated Marginal Means. Results indicate Scots pine forests were more sensitive to invasion than oak forests, with seasonal variations. *R. pseudoacacia* decreased productivity and photosynthetic efficiency in spring but increased them in summer, while *P. serotina* showed opposite trends. In oak forests, only *R. pseudoacacia* exhibited significant effects, altering productivity and canopy structure. Our findings demonstrate the efficacy of multitemporal, multispectral, and radar satellite imagery in assessing the temporal and habitat-dependent impacts of invasive trees on forest ecosystems.

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Posters

Restoring biodiversity and soil multifunctionality: one year of monitoring after de-sealing

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Artificial soil sealing, the covering of soil with impermeable materials, avoid the natural exchange of energy, water, and nutrients, between soil and its surroundings, resulting in compromised soil functioning. De-sealing, the removal of these layers, allows to restore soil multifunctionality and biodiversity at different ecological levels, by creating favourable conditions for plants, microorganisms and pedofauna.

Soil restoration can occur naturally or be supported by treatments, such as the addition of exogenous topsoil, organic and mineral amendments. The reuse of on-site resources such as construction and demolition (C&D) waste as soil forming material seems very promising and sustainable, though their long-term effects remain largely unknown.

To advance the knowledge on de-sealed practices and effects, an experimental study combining circularity principles and biodiversity goals was carried out on a reclaimed site in Milan. The research aimed to: i) monitor changes in soil physicochemical and microbiological characteristics; ii) assess the impact of recycled aggregates from C&D waste on soil and vegetation growth; iii) compare different methods to enhance soil functionality and biodiversity.

While no significant changes in soil properties occurred within a year, variations in pedoclimatic conditions (compared to sealed soil) and slight shifts in the bacterial community were observed. Recycled aggregates were able to support the growth of various plant species including Sorghum, Lolium, and Trifolium, and the addition of compost significantly increased biomass production.

This work presents the results of one-year monitoring period, highlighting the importance of de-sealing and the need for long-term studies to fully assess ecological recovery.

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Posters

Biodiversity conservation and therapeutic products. Evaluating the ready biodegradability of a natural substance-made medical device and a bisacodyl-based drug using UHPLC-qToF

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Human activities have contributed to biodiversity loss due to factors such as pollution. Research shows that pharmaceuticals impact terrestrial and aquatic ecosystems, affecting plants, fish, and animals. In this scenario, the ready biodegradability of two therapeutic products "Sollievo Fisiolax" (a natural substance-made medical device) and "Product A" (a bisacodyl-based drug), both used for constipation relief, was studied. The OECD biodegradability guidelines was followed and UHPLC-qToF mass spectrometry was used. Metabolomics-based approaches providing insights into biodegradability. Both formulated products were found to be readily biodegradable in the test. However, UHPLC-qToF untargeted metabolomic analysis revealed distinct behaviours between the bisacodyl-based product and the natural complex product "Sollievo Fisiolax". Targeted analysis of bisacodyl in "Product A" demonstrated its biotransformation into BHPM, making BHPM the ideal chemical species to monitor for drug contamination in environmental samples.
The study focused on formulated products, as additives can affect biodegradation. It is the first to report that bisacodyl in “Product A”, quickly breaks down to its metabolite BHPM, which does not degrade further. BHPM, the active form and main human metabolite of bisacodyl [1], forms quickly and persists, aligning with ECHA data that it is not readily biodegradable [2]. UHPLC-qToF mass spectrometry was essential for evaluating bisacodyl and its metabolites in complex matrices during the biodegradation study. From a "One Health" perspective, natural substance-based medical devices with efficacy evidence-based provide sustainable therapeutic solutions that benefit both environmental health and biodiversity conservation.

[1] Drugbank, DB09020. Bisacodyl.
[2] ECHA, 2003. p,p'-(2-pyridylmethylene)bisphenol, https://echa.europa.eu/it/registration-dossier/-/registered-dossier/11534/5/3/2.

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Posters

PM2.5 retrieval with Sentinel-5P Data over europe exploiting deep learning

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Monitoring particulate matter is essential due to its significant impact on human health. Ground stations provide precise local-scale pollutant measurements, but their sparse distribution hinders comprehensive global coverage. To overcome this limitation, satellite imagery offers a valuable alternative, enabling near real-time particulate matter estimation over large areas thanks to frequent revisit times and extensive data availability.

This study presents deep learning models for estimating ground-level particulate matter concentrations across Europe. Unlike previous approaches, these models rely solely on radiance data from the Sentinel-5P satellite, excluding commonly used auxiliary inputs such as meteorological data. The proposed methodology demonstrates high estimation accuracy and strong generalization capabilities. Moreover, validation against ground-based measurements confirms its superior performance compared to widely adopted models and datasets that incorporate meteorological variables.

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Posters

The NBFC Network for biodiversity and ecosystem function relationships

Simone Mereu[1,2,3], Sergio Noce[1,3], Gabriele Antoniella[4], Marco Apollonio[1,5], Lorenzo Arcidiaco[2], Francesca Angius[1,6], Alberto Basset[1,7], Alessandra Maria Bissattini[1,8], Giuseppe Brundu[1,6], Rafael da Silveira Bueno[1,9,10], Vincenzo Buono[8], Francesco Boscutti[1,11], Rudy Brogi[1,5], Simona Castaldi[14], Carlo Calfapietra[1,15], Tony Chahine[1,6], Gianluca Cocco[12], Roberta Chirichella[1,13], Tommaso Chiti[1,4], Alessandro Deidda[1,6], Maria Leonarda Fadda[2], Silvano Fares[1,16], Paolo Fiorucci[1,17], Lina Fusaro[1,2], Marta Galvagno[18], Olga Gavrichkova[1,15], Ilaria Guagliardi[16], Carmine Guarino[20], Tommaso La Mantia[1,9], Giovanna Lampreu[12], Vanessa Lozano[6], Federico Magnani[1,21], Marta Magnani[1,19], Grazia Masciandaro[1,15], Giorgio Matteucci[1,2], Francesco Mazzenga[2], Matia Menichini[1,19], Davide Pellegrini[2], Irene Petrosillo[1,7], Maurizio Pinna[1,7], Antonello Prigioniero[20], Antonello Provenzale[1,19], Nicola Ricca[16], Marco Vuerich[1,11], Maria Teresa Tiloca[6], Livia Zapponi[2], Daniela Zuzolo[20], Donatella Spano[1,6,3]

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The National Biodiversity Future Center (NBFC) has established a network of 192 forest sites to assess the relationships between Biodiversity and Ecosystem Functions (BEF). The network focuses on eight of the most abundant tree species in Italy, often found as nearly monospecific forests: Abies alba, Fagus sylvatica, Larix decidua, Picea abies, Quercus cerris, Quercus ilex, Quercus pubescens, and Quercus suber (129 plots). Additionally, 63 plots with similar relative abundance were selected as combinations of two of these eight species.
The sites include 60 plots from the INFC, 3 from ICOS & LTER sites, 16 from old-growth forests, and 113 plots defined by the team members based on pedo-climatic conditions. The network design allows for testing the Net Effect (NE) of species interaction on Ecosystem Functions (EF) and community composition.

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The design allows to assess how the NE of diversity on EF and community composition varies along pedo-climatic and geographical gradients, as all plots have been selected to cover both their own environmental niche and to span the whole Italian territory. Moreover, the activities will shed new light on the relatively less-known effects that species interaction can have on microbial, invertebrate, and vertebrate communities. The common protocol includes: 1) DBH, height, and occurrence of dendro-micro-habitat of all trees within plots; 2) assessment of standing and lying deadwood, and tree seedlings; 3) assessment of root functional traits; 4) soil chemical-physical

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characteristics; and 5) eDNA for microbial communities, invertebrates and vertebrates on soil and litter samples.

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Posters

Innovative solutions for the restoration of the canopy-forming seaweed *Ericaria amentacea*

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Reproduce to restore is one of the most sustainable restorative approaches. Widely used for terrestrial species/habitats, is at its infancy for the marine environment. Combining ecological restoration with integrated multi-trophic aquaculture (IMTA) systems could improve economic, social and environmental benefits and may represent a successful restorative solution.

An experimental IMTA plant was set up in the Ligurian Sea (Lavagna, Genova), involving the co-cultivation of *Sparus aurata, Dicentrarchus labrax, Ostrea edulis* and the seaweed *Ericaria amentacea*.

We compared the traditional ex-situ outplanting approach for restoring *E. amentacea* with an innovative one, involving a period of time in the IMTA system. In the first scenario, after 3 weeks of cultivation in the laboratory, juveniles were directly deployed in the rocky shore of Bergeggi (SV). In the alternative approach, the juveniles were first placed in submerged cages near the aquaculture facility in Lavagna, for a growing period of 4 months. Following this 4-month growth period, *E. amentacea* juveniles were transferred to the rocky shore of Bergeggi.

The growth of *E. amentacea* was monitored under both conditions by assessing the percent cover and measuring the thallus growth.

Based on first observations, the new approach seems to offer advantages: after 7 months from the deployment at sea, both percent cover and thalli length of *E. amentacea* were greater using the innovative IMTA method compared to the traditional approach.

The integration of the brown canopy-forming seaweed *Ericaria amentacea* into a IMTA system presents a promising strategy for large-scale juvenile production, fostering sustainable and efficient restoration efforts.

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Posters

Analysis of micro- and nanoplastics accumulation in human tissues and potential health risks

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Micro- and nanoplastics (MNPs) are emerging as pervasive environmental contaminants with potential long-term effects on human health. These particles, derived from plastic degradation or manufactured intentionally, can enter the human body via ingestion, inhalation, and dermal contact. The ongoing loss of biodiversity and ecosystem degradation exacerbate MNP exposure by impairing natural filtration systems and promoting bioaccumulation along the food chain.

This PhD project—conducted in collaboration between the Universities of Palermo and Pavia—aims to investigate the presence of MNPs in human tissues and biological fluids and assess their potential toxicological effects. The study follows an observational, prospective design, analyzing samples from surgical procedures, autopsies, and biological matrices such as blood, urine, cerebrospinal fluid, feces, and breast milk. Particular attention is given to vulnerable populations, including infants, pregnant women, and patients with chronic or neurodegenerative diseases.

Advanced analytical techniques—including Raman spectroscopy, micro-FTIR, electron microscopy, and mass spectrometry—are employed to detect and characterize MNPs. The project also explores mechanisms of toxicity such as inflammation and oxidative stress, seeking correlations with clinical and subclinical health outcomes.

This research clarifies the links between environmental pollution, ecosystem health, and human well-being, supporting the development of preventive strategies and policy measures. It aligns with the goals of the Nature-Based Future Challenge by reinforcing the importance of biodiversity as a natural defense against emerging contaminants.

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Posters

Invasive alien plants respond differently to physical properties of urban areas: an analysis in three of the largest cities in Italy

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Invasive alien plants are widespread in cities, posing a threat to urban ecosystems, citizen health and urban heritage. Cities offer a wide array of novel suitable habitats. Consequently, understanding how physical properties of cities, such as level of urbanization and urban elements, contribute to their persistence is essential. In response to these two factors, in three major Italian cities – Rome, Milan, Turin – this study focused on the distribution and abundance of a group of highly invasive alien plants. The occurrence of 26 target species was investigated in response to cover and fragmentation of artificial surfaces and type of urban element (e.g. infrastructures, gardens, buildings). With nearly 20,000 occurrences recorded, our study found that the most widespread invasive species were *Ailanthus altissima, Parthenocissus aggr., Phytolacca americana, Robinia pseudoacacia,* and *Sorghum halepense,* with *Ulmus pumila* surprisingly common in Milan and Turin. The results revealed that species adapted to city centers, such as *A. altissima*, contrasted with those more common in suburbs, such as *R. pseudoacacia*. Physical constraints likely limited species' presence on buildings and service areas (e.g., industries, cemeteries), while gardens and roads supported higher species richness and frequency. This comparative study provides valuable insights into the spread of invasive alien plants in cities and the varying degrees of urbanization and type of urban elements in highly urbanized areas

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Invasive alien plants respond differently to physical properties of urban areas: an analysis in three of the largest cities in Italy

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in Southern Europe. This analysis will form the basis of planning tools that will be useful in guiding strategies to mitigate or prevent the spread of invasive alien plants in cities.

Posters

Mining (meta)genomes from (hyper)thermophilic Archaea and Bacteria to discover novel enzymes for the synthesis of the extremolyte cyclic 2,3-diphosphoglycerate

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Extremolytes are specialized compatible solutes synthesized by extremophiles to safeguard cellular components — such as membranes, proteins, and nucleic acids — under extreme environmental conditions, including high temperatures and osmotic stress. These unique compounds hold great promise for applications across pharmaceuticals, healthcare, cosmetics, and life sciences. One notable extremolyte, cyclic 2,3-diphosphoglycerate (cDPG), is a characteristic metabolite of certain hyperthermophilic methanogenic Archaea, such as Methanothermus fervidus. In these organisms, cDPG plays a pivotal role in thermoprotection. Its biosynthesis proceeds via a two-step enzymatic pathway involving 2-phosphoglycerate kinase (2PGK) and cyclic 2,3-diphosphoglycerate synthetase (cDPGS).
In this study, we performed an in silico screening of databases containing (meta)genomes from (hyper)thermophilic Archaea and Bacteria to identify novel 2PGKs and cDPGSs. The corresponding enzymes from Methanothermus fervidus (Mf-2PGK and Mf-cDPGS) were used as query sequences. Based on sequence similarity (~40% identity), two candidate genes for 2PGK and two for cDPGS were selected for heterologous expression in Escherichia coli. Successful overexpression and purification were achieved for both cDPGS candidates and one of the 2PGK candidates. Enzymatic assays revealed that both cDPGSs were active in catalyzing the formation of cDPG, whereas the 2PGK candidate did not exhibit detectable activity in converting 2-phosphoglycerate to 2,3-diphosphoglycerate (2,3-BPG). Further biochemical characterization of the active cDPGSs demonstrated their strong potential for efficient cDPG synthesis from 2,3-BPG.

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Posters

Discovery and characterization of novel enzymes for the depolymerization of polyesters

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Plastic — particularly polyethylene terephthalate (PET), the gold standard for single-use packaging — poses a significant threat to global ecosystems due to its widespread use and resistance to degradation. To enhance plastic recycling, it is essential to implement effective policies and strategies that directly address this challenge. One promising solution is the enzymatic depolymerization of polyesters into their monomeric components, which can then be re-polymerized into materials with virgin-quality properties.

The goal of our work is to discover new enzymes capable of hydrolyzing polyesters such as PET, apply these enzymes to polymer degradation, and use the resulting monomers to re-synthesize materials with virgin-like quality.

Through metagenomic mining, we identified four sequences homologous to well-characterized PET hydrolases and expressed them in *E. coli*. Although expression was successful, the proteins exhibited solubility issues, forming inclusion bodies and complicating purification. To overcome these challenges, we conducted extensive expression trials using different *E. coli* strains and co-expression strategies to improve soluble protein production and increase yields.

The enzymatic activity of purified proteins was evaluated using a colorimetric assay based on the pH indicator Cresol Purple, which shifts from purple to yellow as the pH decreases along with substrate hydrolysis. Subsequently, polymer hydrolysis experiments were performed on various plastics using an automated potentiometric titrator, which maintained a stable pH in the reaction medium throughout the process.

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Posters

Evaluation of *Vigna unguiculata* BBIs extract effect on colorectal cancer models by PET imaging and epigenetic analysis

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Colorectal cancer (CRC) is the third most diagnosed cancer worldwide and its onset depends also on lifestyle, including diet. We investigated with imaging and epigenomic the effect of Vigna unguiculata whole extract intake, rich in protease inhibitors Bowman-Birk Inhibitors (BBIs), on CRC models.
Murine (CT26) and human (HT29) CRC cells were cultured, treated with whole extract and analyzed by RT-PCR. Cells were also implanted in mice, which were treated with oral gavage as follows: Group one started BBIs two weeks before tumor injection (n=10), Group two started at tumor injected (n=10) and Group three received saline solution (controls, n=5). Animals were monitored with [18F]-FDG and [18F]-FLT CT/PET imaging at weeks 2 and 4 to measure glucose metabolism and cell proliferation, respectively. Radiotracers' uptake was expressed as Standard Uptake Value (SUVmean), Metabolic Tumor Volume (MTV), Total Lesion Glycolysis (TLG) and Total Lesion Proliferation (TLP).
In vitro analysis revealed that BBIs reduced cell proliferation of CT26 and HT29 CRC cells, inhibited migration ability of CT26 (increase of E-cadherin and decrease of Snail expression) and changed the cells morphology. Moreover, BBI treatment induced miR-34a upregulation. Unexpectedly, BBIs didn't reduce tumor size or [18F]-FDG/[18F]-FLT uptake in both models, but we observed significant reduction of MTV corrected for tumor size in HT29 lesions, consistently with in vitro experiments. Molecular analysis revealed reduced TNFα and interleukin (IL10, IL4 and IL6) mRNA expression in tumors by both cell lines. The results suggest a possible anti-inflammatory impact of BBI, which could affect both proliferation, migration and MET pathways.

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Posters

Achieving a multispecies garden through co-creation: the case of Sorelle Mirabal Garden in Milan, Italy

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In line with the EU Biodiversity Strategy 2030, local community involvement in urban greening initiatives has become the forefront of cities' response towards reaching the Global Biodiversity framework's expected impacts at local scale. In Milan, Italy, an experimental process of public engagement aiming at enhancing biodiversity values was launched to accompany the reopening of Sorelle Mirabal public garden. The initiative promoted by the Municipality in collaboration with Politecnico di Milano, established an Urban Biodiversity Living Lab (LABU) that includes participatory activities with citizens and biodiversity monitoring with scientists.

In order to design a multispecies public garden, a scientific framework for supporting co-creation together with local stakeholders and experts was envisioned. The co-creation process is ideated in four different phases, and practical tools aim at facilitating the engagement of different actors within the collaborative ideation of the garden. This process is looking at identifying and co-designing specific areas within the living lab physical space in which citizens and different species could co-inhabit. From May till September 2024, a series of workshops and public events have taken place to consolidate the multispecies cohabitation of an area characterized by high biodiversity. The activities within LABU helped to generate a new social acceptance of urban biodiversity relationship by people, both in the phase of design and development of the park and in its management and maintenance. Measures and actions implemented in place have been mainly prioritized and selected by the local stakeholders during a series of co-design workshops.

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Posters

Investigation on *Diospyros kaki* polyphenolic extract's bioactivity and bioaccessibility

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Diospyros kaki is an edible plant known for its antioxidant, hypolipidemic, and antidiabetic effects attributed to the high content of secondary metabolites. Many in vitro studies indicated that plant polyphenols counteract the formation of advanced glycation end compounds (AGEs) which are involved in various disorders (diabetes, cardiovascular, and neurodegenerative diseases). However, in vitro studies are only preliminary and plant-derived metabolites often had low bioaccessibility which limits the in vivo activity. The aim of this study was both to evaluate the anti-glycative properties of Diospyros kaki leaf extract and to assess the bioaccessibility of its phenolic compounds. A glycation model system (in which AGEs were generated) consisting of fructose (FRU) and bovine serum albumin (BSA) was set up under physiological conditions (37 °C, pH 7.4) and the extract's ability to trap methylglyoxal (MGO) and glyoxal (GO) was also investigated. Then, the extract was submitted to a simulated in vitro digestion process (consisting of oral, gastric, and intestinal phases, and using different enzymes and electrolyte mixtures for each phase) to study its bioaccessibility. The different phases were analyzed by RP-HPLC-DAD-ESI-MSn to compare their phenolic profile with the undigested one. The extract inhibited AGEs formation by about 90% and had high MGO and GO trapping abilities, which could be attributed to the identified secondary metabolites, such as kaempferol and quercetin derivatives. After in vitro digestion, a decrease in metabolites concentration was observed due to a dilution effect and compound instability. However, the digested extract still retained anti-glycative properties, even lower.

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Posters

Monitoring wild orchid populations in urban ecosystems

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Orchids (Orchidaceae) expand in diverse habitats, with highest diversity in tropical regions. They show specialized ecological relationships, particularly with pollinators and mycorrhizal fungi. Fungal symbiosis plays a crucial role in seed germination and nutrient acquisition throughout the plant's life, and it shapes the population dynamics, distribution, and biodiversity.
Approximately 2050 orchid species are on the IUCN Global Red List (2023), with 18 Italian species classified as nearly threatened and 2 other classifies as critically endangered due to habitat destruction and climate change, which affect negatively the essential ecological relationships. Indeed, despite urbanization, some orchid species are increasingly found in cities. Recent surveys in Modena and Reggio Emilia recorded species like *Cephalanthera damasonium, Ophrys apifera, Anacamptis morio,* and *Himantoglossum adriaticum* in parks, gardens, and cemeteries.
In 2019, *H. adriaticum* appeared in public park in Reggio Emilia; its population reached 20 plants by 2024. Another significant finding is monitoring one whole population of *O. apifera* in Modena Public Park, exceeding 70 plants.
Reproductive efficiency, assessed through flower-to-capsule ratios, indicates pollinator presence. In 2024, *A. morio* in Modena's cemetery showed 27.9% fertilization, while *H. adriaticum* recorded 41.67–67.89% in 2023, and 40.31_68.13% in 2024. As for *O. apifera* in Modena Public Park showed 58% flowering but only 7.3% fertilization rate. These findings suggest urban environments can support orchids, benefiting biodiversity and environmental health. Monitoring urban orchid populations offers insights into conservation and ecosystem resilience.

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Posters

Glabranin as a natural modulator of AMPK signaling and lipid metabolism in non-alcoholic fatty liver disease

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Non-alcoholic fatty liver disease (NAFLD) is a metabolic disorder characterized by excessive lipid accumulation in hepatocytes and impaired lipid degradation. In the early-stage, NAFLD is considered reversible and targeting key metabolic pathways represents a promising strategy from both a preventive and therapeutic perspective.
Here we present data on the role of the flavonoid glabranin, already known for its anti-inflammatory and antioxidant properties and isolated from *Glycyrrhiza glabra* leaves, in modulating lipid metabolism. We used an in vitro model of hepatic steatosis represented by HepG2 cells treated with oleic and palmitic acids to induce fatty acid overload. Interestingly, the co- treatment with glabranin induced the activation of protein kinase AMPK, the master regulator of lipid metabolism, along with a consistent reduction of lipid droplets, increased mitochondrial membrane potential and resistance to oxidative stress conditions. Consistently, kinome profiling revealed that glabranin co-treatment promotes the activation of kinases involved in lipolysis, autophagy, metabolic regulation and cellular longevity, reflecting key and coordinated regulatory pathways involved in lipid homeostasis restoration. In summary, these findings indicate that glabranin exerts protective metabolic effects in steatotic cells and will be further explored as a promising therapeutic compound for early-stage NAFLD.

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Posters

First assessment of genetic diversity, phylogeographic relationships, and population structure of the seaweed *Ericaria amentacea* from Mediterranean coasts using cytochrome oxidase subunit I (COI) gene

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Ericaria amentacea is an endemic key seaweed species in the coastal ecosystem of the Mediterranean basin. Because it has suffered significant population declines, it has been designated a protected species. Scarce local population genetic studies have been performed on this species. For the first time, mitochondrial cytochrome oxidase subunit I (COI) gene was amplified and analyzed for 23 Mediterranean *E. amentacea* specimens, collected from 4 localities in Liguria and Sardinia Italian coasts. In addition, 26 COI sequences of the same species were retrieved from National Center for Biotechnology Information (NCBI) investigating South Italy, Spain and Greece coasts. Polymorphism results revealed high values of haplotype diversity (Hd) and very low nucleotide diversity (π). Neutrality tests and “mismatch distribution” results suggest that *E. amentacea* populations seems to be in mutation / drift equilibrium characteristic of a demographically stable population. Moreover, results indicated that genetic variation is high, with most of it distributed among populations (78.60%). The important number of haplotypes between localities and the high genetic differentiation (Fst= 0,77) of the current *E. amentacea* populations could be maintained by the limited gene flow Nm (0.49). Both haplotype Network and the biogeographic analysis showed a structured distribution according to the geographic origin. *E. amentacea* populations are subdivided into two major clades: Northern and Southern Mediterranean. Indeed, these results have important implications for conservation actions to counteract the current decline of species populations that require a deep knowledge on their genetic structure.

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Posters

Achillea erba-rotta All. (Asteraceae) in the Western Italian Alps: the contribution of leaf morphology to a long-standing taxonomic problem

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Achillea erba-rotta All. (Asteraceae) is endemic to the Alps with two subspecies: *A. erba-rotta* subsp. erba-rotta of the West Alps and *A. erba-rotta subsp. moschata* (Wulfen) Vacc. At the beginning of the last century, the Valdostane botanist Lino Vaccari (1903; 1904-11) identified numerous varieties, mainly based on the higly variable morphology of the leaves. In this study, the number and size of leaf teeths, leaf perimeter and area, lenght of the toothed leaf and rachis width were found to be traits that discriminate between Vaccari's varietis with more than 70% confidence in most of fresh specimens as well as in Exiccata. The distribution map shows that var. typica occurs only in Piemonte, while var. *ambigua* Heimerl, *morisiana* Rchb. fil. and *haussknechtiana* (Asch.) Vaccari of subsp. *erba-rotta* are distributed along a south-to-north gradient between Piemonte and Valle d'Aosta. Var. *platyrhachis* and *stenorhachis* are found in the northern part of the latter.
The Quaternary geo-climatic events, particularly the existence of a vast peripheral glacial refugium located in the Western Alps between Nice and the southern valleys of the Aosta Valley, separated from the more eastern alpine refugia, may underpin the observed contact zone along the Aosta fondovalle where the two subspecies meet, giving rise to the notable phenotypic variability observed. The findings of this study are essential not only for a more precise taxonomic delineation of the two taxa but also for guiding ongoing genetic analyses of these populations.

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Posters

Is the eradication of the non-native seagrass *Halophila stipulacea* beneficial for invaded native seagrass meadows?

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The Mediterranean Sea is facing an ecological emergency due to the invasion of non-indigenous species. Among these, *Halophila stipulacea* - an invasive seagrass native to Indo-Pacific regions - has recently spread across the Porto Cesareo MPA (Italy), after being observed for the first time in early 2023. This raises concerns for the health status and persistence of the habitat-forming seagrass *Cymodocea nodosa*. The recent implementation of the EU Nature Restoration Law prompts the investigation of alternative approaches for the ecological rehabilitation of degraded systems. In this context, assessing the potential benefit of invasive species removal as a passive restoration strategy for native habitats is of critical importance. This study aims to assess whether the eradication of *H. stipulacea* can favour the persistence/recovery of *C. nodosa* and if the resilience of *C. nodosa* is density-dependent. We conducted a manipulative experiment using fixed 50x50 cm quadrats (n = 6 per treatment) across three patch types in *C. nodosa* meadows: invaded (i), non-invaded (ii), and invaded by *H. stipulacea* and periodically eradicated (iii). Within each condition, we selected *C. nodosa* patches with high (7,1 ± 0,5 shoots/dm^2) and low (2,4 ± 0,4 shoots/dm^2) shoot densities. Regular removal of *H. stipulacea* was carried out since November 2024 throughout the experiment. Our findings will be useful to demonstrate if the removal of the alien is a feasible restoration option and to inform future management strategies aimed at the protection of native meadows.

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Posters

Development of an evidence-based Decision-Support System (DSS) for the upscaling of green roofs in urban Euro-Mediterranean contexts

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State-of-the-art on green roofs suggests that these nature-based solutions (NbS) are powerful tools to mitigate environmental and socio-economic impacts at building and neighbourhood scale. However, sustainable urban planning is not yet provided with easy-to-transfer knowledge and tools on how to take advantage of those NbS. This study aims to develop an evidence-based Decision Support System (DSS) to assist urban planners and policymakers in selecting the most effective green roof configurations based on environmental and socioeconomic criteria. A literature review was first conducted analysing 34 publications that cover 56 case studies. A database of 196 indicators was created, categorizing and aligning them according to societal challenges identified by the European Commission's NbS framework. The DSS approach is then applied for testing and validation purposes to a case study in Terni, Italy, evaluating different green roof implementation scenarios. Results demonstrate the potential of the DSS to facilitate data-driven decision-making by integrating performance indicators and stakeholder priorities. Findings highlight the need for structured approaches in NbS planning to maximize ecosystem services and optimize urban resilience strategies.

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Posters

Uncovered *Festuca* diversity in the Italian peninsula: early results

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Fine-leaved fescues (*Festuca sect. Festuca*) are a highly diverse group of grasses known for their valuable ecological traits. They exhibit strong drought tolerance, resilience to both high and low temperatures, and rapid proliferation, making them well-suited to harsh environmental conditions. These characteristics have made fine-leaved fescues particularly valuable for nature-based applications in different fields, including wildfire control through rangeland greenstrips, sustainable turf development, and habitat restoration.

However, the functional adaptations that fine-leaved fescues have developed result in striking morphological similarities among species, making them one of the most taxonomically challenging groups of vascular plants. Their difficult and often confused taxonomic and nomenclatural history further complicates species identification, leading to unreliable records and misidentifications. This lack of clarity frequently results in the improper use of species in nature-based solutions, which may lead to the reduced effectiveness of efforts involving these plants. Therefore, a deeper understanding of these taxa is essential for ensuring the effective and accurate application of fine-leaved fescues in ecological restoration and other sustainability-focused projects

To address these issues, a revision of the Festuca stricta/valesiaca complex is currently underway. This complex is particularly significant as it has not been addressed in previous taxonomic studies and includes species endemic to Italy. It also includes *F. trachyphylla*, one of the most widely used species in xerophilic grasslands restoration. Early findings from morphological and ploidy analyses have already revealed a greater diversity within this complex in Italy than previously recognized, highlighting how poorly understood these species remain.

Posters

Regulation of urban air quality through leaf functional trait diversity in Piazza della Scienza

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Whereas impermeable surfaces do little to attenuate particulate matter in the air, the leaves of urban vegetation add three-dimensional complexity and dramatically increase the surface area to which particulate matter may be deposited and immobilized. Leaf traits such as leaf shape, trichome and stomatal density, and epidermal wax not only vary between species but may also be employed as valuable predictors of PM deposition. In Piazza della Scienza we are studying the role that diversity in leaf functional traits plays in altering the concentrations of airborne particulate matter using different combinations of evergreen and deciduous plant species, quantification of PM deposition on leaf surfaces, leaf trait analyses and continuous monitoring of above and below canopy PM concentrations with sensors. These data will test currently established indices correlating leaf trait intensities with levels of PM deposition and will provide further information to develop and refine these indices through the introduction of new trait variables. Furthermore, our data will be used in collaboration with microbiologists to assess the effect that trait intensity has on the diversity and size of the microbial community of the phyllosphere (leaf surface), some members of which are now known to be capable of degrading airborne hydrocarbon pollutants deposited on the epidermal layer of leaves. We expect to find that certain traits are more highly correlated with PM deposition and that trait biodiversity increases PM attenuation over a cycle of meteorological seasons.

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Posters

Monitoring of ground beetles (Coleoptera, Carabidae) in an experimental tree plantation in the city of Campobasso

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This study aims to analyze the composition of ground-dwelling fauna, with a particular focus on ground beetles (Coleoptera, Carabidae), to gather information on the ecological quality of the urban ecosystem and the colonization dynamics of newly established experimental forested areas.

In 2023, an experimental tree plantation was established on approximately 0.74 hectares within the urban area of Campobasso. The intervention included the creation of six experimental "forested" plots, each measuring 20x20 m, with different compositions of trees and shrubs, as well as a 10x10 m control plot left to natural succession. The six experimental plots were designed with three different configurations: two plots with serial shrubland at modular density, two plots with 70% trees and 30% shrubs, and two plots with 30% trees and 70% shrubs.

To assess biodiversity within the experimental plantation, ground-dwelling entomofauna is currently being monitored. Specifically, two pitfall traps have been installed in each plot. Sampling began in July 2024 and will continue for one year.

The results of this study will contribute to a better understanding of how ground fauna responds to different planting regimes and the management of rewilded urban areas.

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Posters

Operationalizing closer-to-nature forest management: application of the energy-equivalence principle in a holm oak (*Quercus ilex* L.) Mediterranean forest

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Recent European Commission documents emphasize the need for guidelines to implement Closer-to-Nature Forest Management (CNFM). However, current technical guidelines miss providing detailed practices suited to diverse environmental contexts. We propose a simple, universal tool to complement existing strategies for implementing CNFM. Empirical data and theoretical models suggest that old-growth forests tend to achieve a structure consistent with the Energy Equivalence Principle (EEP), where changes in size-class abundance are balanced by changes in individual resource use. We applied the EEP approach as a management tool in two Mediterranean evergreen holm oak forests in Sardinia, Italy: one old-growth (OG) and one recently disturbed (IoS). Using basic tree metrics—height, diameter, crown length, radius and crown volume (as a proxy for resource use)—we predicted EEP individual tree distributions. Results showed that holm oak dominated the top layer of both forest types (98%), but species diversity was higher in the OG regeneration. The scaling of holm oak crown volume with height was α = 3.00 (CI±0.19). The exponent of potential EEP diameter distribution was β = -2.44, while the actual status of the forest structure was represented by significantly different slopes β = -1.99 (CI±0.11) and β=-1.36 (CI±0.21) for OG and IoS respectively. OG structure closely resembled EEP distribution, whereas IoS reflected the typical intermediate stage structure found in forest stands. Comparing EEP-based distribution with current forest structures enabled identification of precise intervention targets in each silvicultural class, guiding forest managers to design community structures more aligned with natural processes, enhancing forest multifunctionality.

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Posters

Urbanization drives adaptive divergence in *Raphanus raphanistrum*

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Urbanization leads to the transformations of abiotic and biotic environments in ways that mediate evolutionary adaptation in organisms. However, the impact of urbanization on evolutionary processes in populations remains poorly understood. Here, we investigate how urbanization shapes the evolutionary response of *Raphanus raphanistrum*. We conducted field studies across the Campania region in southern Italy to examine the phenotypic divergence between urban and natural populations of *R. raphanistrum*. Subsequently, we collected seeds from urban and natural populations and performed a common garden experiment to assess adaptive evolution. We found that urban populations had significantly smaller flowers and shorter flowering times compared to natural populations. The common garden experiment suggest genetically based adaptation was underpinned this divergence. Selection analysis demonstrated natural selection favoured shorter flowering times and larger flowers, regardless of the populations' origin.
However, a trade-off between flowering time and flower size suggests distinct selection patterns in natural and urban habitats. Specifically, plants with shorter flowering times were favoured in urban environments, whereas those with large flowers were selected in natural habitats. Overall, our findings highlight how natural selection shapes adaptive phenotypic divergence in *R. raphanistrum* in response to urbanization.

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Posters

DNA barcoding of Italian vertebrates

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Although Italy is known biodiversity hotspot, knowledge about genetic diversity is still generally lacking. This is especially evident for the class of birds, one of the best known and most studied vertebrate groups, of which only 311 sequences belonging to 31 species and 29 BINs are currently present on BOLDSystem.
As part of the BaC “BIOURBAN-IMON” project, we started an extensive sequencing of the mitochondrial Cytochrome c Oxidase I (COI) region, used as a standard for animal DNA barcoding.
Comprehensive DNA barcode reference libraries are essential not only for species-level identification but also for small- and large-scale species evolution and diversity studies, species identification by eDNA metabarcoding, forensic analyses, and species conservation efforts.
Our group has developed two biobanks of Italian birds: one from 2000s consisting of muscle associated with voucher specimens, the other consisting of blood associated with biometric data. These resources, along with the scientific collections of the Carmagnola Museum of Natural History, enabled COI sequencing of Italian birds, reptiles, amphibians, and mammals.
So far, we’ve sequenced over 160 Italian bird species (1–8 samples each from across the peninsula, Sicily, and Sardinia), increasing BOLD coverage by 500% in species and 140% in sequences. Our goal is to reach 90% national species coverage. Work is ongoing to expand the genetic reference database for all Italian terrestrial vertebrates, including reptiles, amphibians, and mammals, groups better represented in BOLD but still missing some species.

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Posters

Characterization of *Zygosaccharomyces bailii* KAV1 isolated from kombucha: a promising yeast for human health modulation

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Kombucha is a fermented beverage obtained from sweetened tea, characterized by a complex microbial consortium primarily composed of yeasts and acetic acid bacteria. This study originates from the characterization of the kombucha microbiota, with the aim of investigating its potential impact on human health through probiotic, paraprobiotic, or postbiotic activities. Given the limited characterization of probiotic yeasts, our attention was focused on *Zygosaccharomyces bailii* strains we isolated from kombucha, aiming at evaluating their probiotic or postbiotic potential.
Z. bailii is frequently found in food matrices and, although historically considered a spoilage organism, it is also involved in desired fermentations such as those of wine and kombucha. We primarily assessed the safety of the kombucha isolate *Z. bailii* KAV1, showing that it belongs to BioSafety Level 1 and does not display hemolytic activity on blood agar plates. Subsequently, antioxidant activity was evaluated using the DPPH assay and catalase activity quantification. GC-MS analysis of fermentation products revealed the production of notable amounts of butyrate and other short-chain fatty acids (SCFAs). Finally, immunomodulatory effects were assessed on human peripheral blood mononuclear cells (PBMCs), showing a significant reduction in TNF-α production. These preliminary findings suggest that *Z. bailii* KAV1 may have a beneficial modulatory effect on human health and could represent a promising candidate as a probiotic yeast.

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Posters

Length-weight relationship at order level for efficient biomass estimation

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Non-taxonomic functional descriptors, particularly those corresponding to body size at the individual level, are becoming ever more central in the assessment of ecosystem functioning, particularly with respect to climate change and mounting environmental stresses. Among these, length-weight relations are a convenient means of obtaining organism biomass quickly and in standard form, without the need for detailed taxonomic identification. These approaches are grounded in well-developed community ecology theory highlighting the key role of body size in species coexistence processes, community structuring, and resource allocation.

We describe here the development of a computational approach to predict body weight (in ash-free dry weight) from body length, using length-weight relationships at the taxonomic order level. It was built using existing data at species-level on length-weight regressions with a resulting dataset that approximates the length-weight relationship for 144 orders of all the animal kingdom, with the goal of providing accurate and generally applicable biomass estimates for large taxa. The proposed model makes it possible to efficiently obtain biomass data, which are useful for functional community analyses, ecological assessments and environmental monitoring.

This approach helps bridge the gap in the provision of high-resolution quantitative data by providing a pragmatic and transferable tool for ecological studies in terrestrial and aquatic ecosystems.

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Posters

Nature-based Solutions efficiency in urban areas: looking for suitable soil-plant-atmosphere indicators

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In recent years, the role of nature-based solutions (NbS) in restoring soil functionality in urban areas has been widely recognized. From a scientific perspective, several soil health indicators have been proposed for evaluating NbS efficiency in providing ecosystem services (e.g carbon and nutrient cycles). However, the soil-plant-atmosphere system plays a crucial role in ensuring the effectiveness of NbS, especially in urban areas. In light of this, selecting specific indicators related to the soil-plant-atmosphere system has become important.

This paper reports a case study carried out in the municipality of Firenze. Several NbS with different land uses (e.g. recent and historical parks, water detention basins, street trees), selected based on green cover and fragmentation degree, were monitored in the urban and suburban areas. In each site, specific indicators for the soil-plant-atmosphere system, such as soil enzyme activities, soil and plant isotopes, plant functional traits, and air quality were investigated.

The air quality index, calculated from NCO_2, PM2.5, PM10, and O_3 air concentrations, significantly differed between urban and suburban areas. Moreover, the isotope signatures of δ13C and δ15N and enzymatic stoichiometry provided relevant information about the functioning of the selected NbS in across the Firenze municipality.

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Posters

Changes of ground dwelling arthropods along an urbanization gradient in four Italian cities

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Urbanization strongly impacts biodiversity and related ecosystem services. A proper evaluation of the effects of urbanization on biodiversity is thus compelling. This study investigates the response of ground-dwelling arthropods to urbanization across four Italian cities: Torino, Milano, Roma, and Firenze. In each city, seven to nine sites were selected along a gradient of urbanization. For each sampling site, we identified a first subplot in an urban park, and a second one in a smaller green area embedded in the urban matrix, where we sampled using pitfall traps during three sessions of three weeks each, from mid April to late July 2023.
3975 individuals belonging to six major groups were sorted and identified to species level: Araneae, Coleoptera Carabidae and Tenebrionidae, Isopoda, Chilopoda and Pseudoscorpiones. Preliminary results revealed that all analyzed groups are generally more abundant and diverse in greener sites and in less fragmented subplots, whereas Carabidae showed the opposite trend and Tenebrionidae did not exhibit any response. Subsequently, we calculated the taxonomic distinctness (Δ) for each trap, considering all target groups, and tested its response to urbanization. An increase in urban green areas is associated with contrasting trends: while Turin and Milan show increased Δ in greener sites, in contrast Rome and Florence display the opposite pattern. These findings suggest that the influence of urban green space on arthropod assemblages is context-dependent, underscoring the importance of designing context-specific urban planning and conservation strategies to effectively sustain arthropod biodiversity in rapidly urbanizing landscapes.

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Posters

A systematic review of marine metabolomics: tracing the metabolic footprint of environmental stress

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Environmental stressors, both natural and anthropogenic, can strongly influence the organism's performance and resilience ability. Understanding how organisms respond to these stressors is crucial to predict the broader ecological consequences of environmental change. Among the different physiological responses, metabolic alterations are among the earliest and most sensitive indicators of environmental stress. Metabolomics - the study of metabolites – has emerged as a powerful tool in this context. Environmental metabolomics allows for the assessment of immediate biochemical responses of the organisms to changes in the external environment. The metabolism of marine animals is interdependent with many physiological factors, such as age, size, sex and reproductive stage, but it also depends on the environmental drivers. For instance, a shift in environmental conditions can alter the organism's metabolome, consequentially defining a variation in the organism's performance and ultimately fitness. Given the complexity of metabolic responses and the growing interest in multiple stressor impacts, we conducted a systematic literature review to better understand how metabolomics has been applied in marine environmental studies and how organisms' responses may change according to stressors' properties and interactions.

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Posters

Planning for restoration: a spatial approach to *Ostrea edulis* recovery through restorative aquaculture in the Nora Lagoon (Sardinia, Italy)

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This pilot study exemplifies the integration of ecological planning with restorative aquaculture to promote aquatic ecosystem conservation. The project focuses on the restoration of the European flat oyster (*Ostrea edulis*) in the Nora Lagoon (Sardinia, Italy), a key species listed as vulnerable and declining by OSPAR and at risk of collapse under IUCN Red List criteria. As recognised ecosystem engineers, oysters play a vital ecological role by providing significant environmental benefits through their filtering capacity, improving water quality, supporting habitat formation, and enhancing biodiversity by providing shelter and food for a variety of marine organisms. Within this framework, restorative aquaculture serves as a strategic tool for ecological recovery, fostering oyster reproduction and juveniles' production for their reintroduction into suitable environments. A systematic in-situ environmental monitoring is in place to characterise ecosystem conditions and to identify optimal areas for restoration. These data will inform habitat suitability modelling, optimal site identification, and intervention strategies, aiming to maximise ecological outcomes over the long-term. Expected results include increased oyster biomass compared to natural population, and a measurable enhancement in local biodiversity and ecosystem functionality. This project stands as a model for aligning conservation goals with the sustainable use of natural resources, demonstrating how ecological restoration and responsible aquaculture can operate synergistically. The approach is designed to be scalable and replicable in other Mediterranean areas and beyond, contributing to broader objectives of marine ecosystem restoration, biodiversity conservation, and coastal community resilience.

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Posters

Assessing the environmental risk of pharmaceuticals in the Italian waters: an integrated approach

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Environmental risk assessment (ERA) of pharmaceuticals is an essential process aimed at safeguarding our ecosystems from potential harm caused by medicines. The present project aimed to assess the environmental risk of pharmaceuticals in Italian waters by using two complementary approaches.
On one hand we assessed the environmental potential risk by collecting physico-chemical characteristics and (eco)toxicological data for more than project 300 compounds used in pharmaceutical products (such as APIs, preservatives, artificial sweeteners, dyes as well as some selected stable metabolites). The list of substances has been created by a prioritization process that involves the collection of actually measured drugs in Italian waters, the official consumption data and expert judgments of medical specialists from various therapeutic sectors. The data have been collected from different databases and they have been organized in technical sheets. A scoring system has been developed in order to calculate a presumed level of potential environmental risk for each substance.
On the other hand, we planned to measure the actual concentrations of the listed substances in the Italian surface, ground and drinking waters, by sampling more than 100 site along the Italian peninsula aiming to cover the variety of water body geographical typologies, pollution pressures and water uses. The availability of measured concentrations will allow to calculate the site-specific risk using the risk quotient approach as the ration between measured concentrations (MEC) and PNEC of specific end-points.

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Posters

Studying the Italian tardigrade biodiversity through the Citizen science project “Tardigrades go to school!”

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Italy is a biodiversity hotspot in Europe, rich in species, endemisms, and biogeographical regions, to which tardigrades also contribute. Knowledge of the terrestrial Italian biodiversity of tardigrades is not exhaustive yet, and many areas remain unexplored. As their charming appearance and stress resistance make them popular, the Citizen Science project ‘Tardigrades go to school!’ aims to involve students to map the distribution of moss-dwelling tardigrades, developing the awareness of the value of biodiversity and responsibility for its conservation in younger generations.

Students are trained about tardigrades and their biodiversity through meetings and informative material. During school hands-on activities, they collect moss samples from the school garden, extract and observe tardigrades using everyday materials. The school trips are useful to gather more mosses, filling out data sheets, search for tardigrades, and send samples to tardigradologists for the faunistic analysis with an integrative approach. Attending classes receive a certificate, and results are shared through reports, meetings, or the EvoZooLab website. The analysed samples obtained from primary and secondary schools in Northern Italy revealed a broad range of biodiversity, including rare and potential new tardigrade species. The project is expanding to involve more schools across Italy enabling a detailed study of tardigrades’ biodiversity, the monitoring of their Italian distribution and conservation status. It encourages citizen collaboration to provide samples for researchers and promotes awareness, responsibility, and interest in tardigrades and environmental issues among students.

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Posters

The mycobiota of a soil contaminated by polycyclic aromatic hydrocarbons in a former urban garden: from the study of biodiversity to the mycoremediation potential

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The soil ecosystem is variable and complex and host a huge variety of microorganisms, including fungi, that provide several ecosystem services.
Due to the increase of industrial activities and to the combustion of fossil fuels and organic matter, the release of polyaromatic hydrocarbons (PAHs) threatens the health of natural ecosystems. Soil contamination by PAHs is an ever more severe issue that requires a sustainable solution. A wide range of fungi are capable of degrading these recalcitrant compounds through their enzymatic arsenal. Thus, investigating and identifying the cultivable mycobiota inhabiting PAH-contaminated soils is crucial for designing appropriate remediation approaches.
In this work, we investigated the fungal diversity of a formerly cultivated urban garden in Torino (Italy), mainly contaminated by benzo(a)pyrene, benzo(g,h,i)perylene, fluoranthene, and fhenanthrene.
Overall, 181 fungal isolates, mostly belonging to Ascomycota were retrieved and were affiliated to 38 genera and 66 species, including putative novel taxa. In parallel, a metabarcoding analysis applied to investigate the unculturable diversity, confirmed the dominance of Ascomycota (99%), while Basidiomycota and Mortierellomycota accounted for less than 1%.
Following, to select those strains capable of degrading PAHs, enrichment assays were conducted with the target pollutants as sole carbon source. Interestingly, many of the 105 isolates retrieved belonged to species that were not detected in the previous analysis of the bulk soil. These organisms are currently object of deep investigation whose outcome will serve to evaluate their degradative potential and to plan and develop remediation strategies, based on microbial consortia, for in situ applications.

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Posters

Resilience of coastal habitats under multiple stressors: mechanisms, connectivity and conservation strategies

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Understanding how multiple stressors interact in coastal ecosystems is one of the most pressing challenges, especially in the context of climate change. Intertidal habitats, exposed to string environmental variability and anthropogenic impacts, are particularly vulnerable. Their resilience - the ability to absorb and recover from disturbances – depends on a complex interplay of biotic and abiotic factors. The aim of my doctoral research is to identify and quantify the main drivers influencing resilience of intertidal communities. Through a comprehensive global literature review, I will investigate how multiple stressors, such as temperature fluctuations, dessication, lights and human activities, may affect survival, growth and community connectivity. By focusing on both species- and community- level responses, this synthesis will highlight the most impactful stressors and identify knowledge gaps critical for target conservation actions. The project also integrates experimental work to assess how stressors affect habitat-forming species, such as *Ericaria amentacea* and *Dendropoma cristatum*, under controlled conditions. In addition to this, studies will be conducted on larval stages and propagules, which are the most important phases regarding connectivity, using specialized software to evaluate the effects of multiple stressors on resilience throughout the dispersal process in intertidal ecosystems. This empirical data will be used to develop predictive models that incorporate resilience mechanisms and connectivity dynamics. Ultimately, the goal is to provide practical, accessible tools to support the management and conservation of coastal ecosystems facing rapid environmental change.

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Posters

Monitoring the quality of the pearl oyster *Pinctada radiata* (Leach, 1814) in the Gulf of Taranto: can an invasion be changed into a gain?

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Within Spoke 2 Activity 2 Task 3.2 the Research Unit of CNR IRSA Taranto monitored the microbiological and nutritional quality as well as PAHs and PCBs content of the invasive Atlantic pearl oysters *Pinctada radiata* in the Gulf of Taranto. Oysters were located in lanterns in an integrated multitrophic aquaculture (IMTA) system and co-cultured with polychaetes and macroalgae around fish cages. Oysters were found to be of good microbiological and nutritional quality. Microbial pollution indicators, 16 EPA, PAHs and 7 PCBs targets were below the limit established by European legislation. *P. radiata* had a lipid content of 2.62% (wet weight) and high levels of polyunsaturated fatty acids (PUFA), especially docosahexaenoic acid (DHA) from the omega-3 series, which constituted 21.5% of total fatty acids. The optimal omega-3/omega-6 ratio (4.50) further improved its nutritional value, making it a promising human food source. The resulting nutritional value, chemical and microbiological quality provide valuable information on *P. radiata* along the Italian coasts and result intriguing in light of the potential commercial exploitation and recycling options of *P. radiata* in eradication programs of this invasive species. In particular, this pearl oyster has been observed in the Gulf of Taranto since 2015 and has now become very common. Furthermore, in the last 2 years *P. radiata* has demonstrated its ability to overcome the heat waves occurred in the Gulf of Taranto in the summer period which instead determined the decline of the mussel *Mytilus galloprovincialis* with consequent inability for this species to reach the commercial size.

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Posters

Warming-Driven Biotic Differentiation of Demersal Fish across depths in the Central Mediterranean Sea

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Seawater warming, plays an important role in the redistribution of biodiversity by displacing cool-water species and promoting the expansion of warm-water species in certain regions. To date, many studies have assessed the effects of warming on species richness and composition at regional and global scales, but few have focused on vertical shifts in the composition of marine assemblages as a result of changing thermal conditions at different depths, particularly in the Mediterranean basin. Here, we analyze a time series from 2007 to 2023 of teleost fish assemblages monitored in 1,678 trawl hauls in the Central Mediterranean, ranging from 10-800 m depth. The study area is considered an important biodiversity hotspot and a corridor for the westward expansion of warm-water species from the warmer Levantine basin. By estimating the rate of change in beta-diversity of demersal fish assemblages across depths, we observed a rearrangement of species composition driven by changes in bottom temperature. We found an increase in assemblage differentiation strictly associated with a change in depth range occupancy of species, while local and regional diversity did not change significantly. Our results suggest a key role for seawater warming in differentiating demersal fish community composition along depth gradients and anticipate potential similar responses in other areas of the Mediterranean. Understanding bathymetric variation in taxonomic composition, which may result from depth expansion or reduction of species with non-equivalent functional roles within ecosystems, could help predict changes in ecosystem functioning and services, and prevent overexploitation of fishery resources as their depth distribution changes.

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Posters

Tracking invader(s): molecular insights into the spread of the invasive whitefly *Aleurocanthus spiniferus* (Hemiptera) in Northern Italy and its exotic parasitoid *Encarsia nipponica* (Hymenoptera)

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In recent years, the introduction of invasive insect species such as the polyphagous orange spiny whitefly ("OSW"; *Aleurocanthus spiniferus*) has caused significant economic damage in certain regions of Italy. This species poses a serious threat to agricultural production, reducing crop yields and increasing management costs. Due to its harmfulness, OSW has been classified as quarantine pest organism relevant to the European Union. Additionally, potential alien parasitoids of this exotic invader may offer opportunities for its biological control but also raise concerns about their impact on native biodiversity. In this study, a combination of morphological and molecular approaches was used to investigate *A. spiniferus* in Emilia-Romagna. Genetic analyses targeting mitochondrial COI and 16S genes enabled accurate identification of the pest, revealing the occurrence of three *A. spiniferus* haplotypes – including one reported for the first time in Europe, previously found only in China. This provided new insights into the geographical origin of OSW exotic specimens and their potential invasion routes. Moreover, specimens of *Encarsia* were found, and morphological and molecular analyses of COI and 28S genes pointed out that they belong to *E. nipponica*, an exotic taxon never previously found in Europe.
These results provide new insights into the distribution patterns of both species in Italy. Further analysis on early detection, biological control programs, and risk assessment are underway in the Emilia-Romagna region in collaboration with the Emilia-Romagna Regional Plant Protection Service.

Posters

DNA metabarcoding for assessing ecosystem services in urban environments

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Ecosystem services are particularly threatened in urban areas, where natural habitats are increasingly under pressure. This raises concerns about potential effects of urbanization on pollinator-plant interactions and prey-predator dynamics, which are often difficult to assess due to the challenges of identifying digested material and pollen through traditional morphological methods. For this reason, a molecular-based approach such as DNA metabarcoding could help in obtaining a more detailed and accurate comprehension of these interactions.

In this study, organized within the framework of activities of Task 5.4 – Spoke 5 NBFC, employed DNA metabarcoding to investigate multi-taxa interactions that underpin regulatory ecosystem services in urban environments: pollination and biological control. Fecal samples were collected from two vertebrate taxa, namely lizards (*Podarcis siculus* and *P. muralis*), birds (*Parus major* and *Cyanistes caeruleus*) and pollen transported by wild bee and syrphid communities was retrieved over three months across large cities (range: 2-6 per taxon) of the Italian Peninsula.

In total, 105 fecal samples were obtained from nestling birds, 133 from adult lizards and 2.090 pollen samples were collected from insect bodies. DNA from these complex samples was extracted and after careful primer selection (followed by end-point PCR to verify primer specificity), were then sequenced using Illumina MiSeq technology and up-to-date bioinformatic pipelines to explore trophic and mutualistic interactions.

The results of this study will be valuable for guiding the management of green urban areas, informing ecological restoration efforts, and supporting conservation policies aimed at safeguarding biodiversity and the ecosystem services it provides.

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Posters

Sustainable valorization of artichoke by-products: innovative extraction and eco-friendly applications for bioactive compounds and polymers

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The valorization of agricultural by-products, particularly artichoke waste, offers significant potential for sustainable practices in both food and material industries. Building on previous research optimizing green extraction methods, we have developed an innovative system for extracting bioactive compounds from artichoke by-products. The system utilizes ultrasound-assisted maceration in water to extract chlorogenic acid and cynarine, achieving concentrations of 5%, followed by tangential filtration to recover inulin. The macerate is then purified to enhance bioactive concentrations above 12%. The residual biomass is processed into compost or used to extract lignocellulosic material, which is converted into polylactic acid (PLA) for biodegradable films. This system can process up to 100 kg of artichoke biomass per day, contributing to waste reduction. In addition to these innovations, the bioactive compounds extracted from artichoke by-products are being explored for a wide range of applications. Our goal is to develop a versatile ingredient that can be utilized across various sectors, including food, nutraceuticals, cosmetics, and zootechnics. We are specifically investigating its potential in bakery products such as biscuits and pasta, as well as in liquors. At the same time, we are producing natural polymers from these by-products for sustainable, eco-friendly applications. This work is part of the UFRAT (Urban Food Recovery and Transformation) project (MUSA"ECS_00000037), where Vitrosele, a leader in the artichoke industry, is a key partner. The project aims to create sustainable, economically viable systems for the recovery and industrial processing of local agricultural by-products, benefiting both the environment and the regional economy.

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Posters

Green sentinel of the Tyrrhenian Sea: *Posidonia oceanica* reveals emerging contaminants

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The Mediterranean Sea, despite covering only a small fraction of the world's oceans, is a biodiversity hotspot hosting over 7.5% of global marine species, including the endemic seagrass *Posidonia oceanica*. This habitat-forming species plays a crucial role in carbon cycling, coastal protection and overall ecosystem functioning, while also serving as a biological sentinel of environmental change. The Mediterranean is increasingly threatened by anthropogenic pressures, climate change, and contamination, including both legacy pollutants and contaminants of emerging concern. Phenolic endocrine-disrupting compounds (PEDCs) have gained considerable attention from scientists and the European Commission due to their potential toxic effects on wildlife and humans.
This study investigates the occurrence and bioaccumulation of key PEDCs—bisphenol A (BPA), 4-nonylphenol (4-NP), and its monoethoxylate (NP1EO) and diethoxylate (NP2EO) precursors—in seawater, sediment, and *P. oceanica* (leaves and rhizomes). Samples were collected from two Tyrrhenian Sea sites: the Marine Protected Area of Secche di Tor Paterno and Giglio Island. Sampling was conducted in autumn 2023 and 2024 at Tor Paterno, and in summer and winter 2024 at Giglio Island.
PEDCs were detected in all matrices across both sites, with a clear seasonal trend at Giglio Island: higher concentrations were recorded during the summer, coinciding with peak tourist activity. Seawater from Giglio Island exhibited the highest PEDC levels overall, exceeding those found at Tor Paterno.
These findings highlight the potential of *P. oceanica* as a bioindicator for PEDCs and emphasize the need to integrate biological monitoring tools into marine pollution assessment frameworks, particularly in high-pressure coastal zones.

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Posters

Evaluation of the modulation of oxidative stress in response to natural bioactive molecules: identification of theranostic biomarkers

Sofia Remedia[1,2,3], Cristina Martelli[4], Mauro Commisso[2,5], Linda Avesani[2,5], Gloria Bertoli[1,2], Luisa Ottorini[1,4], Alessia Lo Dico[1,2]

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Glioblastoma (GBM) is the most aggressive brain tumor in adults, with poor prognosis due to frequent resistance to Temozolomide (TMZ)-based therapies. Recent studies highlight Ferroptosis - a regulated, iron-dependent form of cell death driven by lipid peroxidation and oxidative stress - as a potential therapeutic strategy to overcome this resistance.

Biodiversity represents a valuable source of natural compounds with anticancer properties. Several phyto-complexes are currently under investigation. In our recent publication, we demonstrated that selected plant extracts significantly reduced proliferation, migration, and inflammation in GBM cell lines. Many of these natural compounds act as modulators of oxidative stress, a focus of our current study.

We tested three ferroptosis inducers (Erastin, FIN56, RSL3) in combination with a natural extract (i.e. Oxalis Debilis Kunth) in human GBM cell lines with varying TMZ responsiveness. Cellular, molecular, and biochemical assays confirmed an increased cytotoxic effect due to enhanced oxidative stress, validated also in 3D spheroid models. In resistant cells, the induction of ferroptosis led to mitochondrial ROS accumulation, lipid peroxidation, and downregulation of detox-related genes.

Moreover, ferroptosis inducers reduced the expression and activity of hypoxia-inducible factor (HIF)-1α, a key marker of therapy resistance. Preliminary results with Oxalis Debilis Kunth alone showed decreased cell viability and HIF-1α downregulation. Gene expression data supported the activation of the ferroptotic pathway.

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In conclusion, combining natural compounds with ferroptosis induction could represent a novel adjuvant strategy against GBM. Further studies are planned to explore additional molecular mechanisms and assess therapeutic potential in vivo.

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Posters

Bioconversion of medium-chain fatty acids into food flavor compounds

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The bioconversion of medium-chain fatty acids into methyl ketones, represents a sustainable approach to natural cheese flavour production. In this study, we explored the transformation of caprylic acid (C8), capric acid (C10), lauric acid (C12) and myristic acid (C14) into 2-heptanone, 2-nonanone, 2-undecanone and 2-tridecanone respectively, using selected fungal and yeast strains classified as Generally Recognized As Safe (GRAS). These ketones are the key flavour compounds found in blue cheese, where they contribute also to its buttery, floral and fruity notes. These compounds, in natural form, have high economic value holding a relevant place in the market of natural flavours.
Fungal strains like Penicillium and Trichoderma were cultivated under specific conditions with fatty acids supplied as substrates. The conversion efficiency and ketone profiles were analyzed using gas chromatography-mass spectrometry (GC-MS) and showed that caprylic, capric and lauric acid were efficiently converted into the corresponding methyl ketones.
The great biodiversity of the tested microorganisms allowed us to find the ones that provided highest conversion, particularly with caprylic and capric acids. Then, the process was optimized and scaled up, further enhancing ketone production. These findings highlight the potential of GRAS-status microorganisms for producing natural flavoring agents from renewable lipid sources, offering a viable alternative to chemical synthesis.

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Posters

Filling the biodiversity gap in afforestation projects: reintroducing herbaceous species to urban forests

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Afforestation projects in lowland areas generally focus on tree species and overlook the herbaceous layer. Consequently, many planted woodlands lack the characteristic forest understory species typical of natural woodlands.
This project explores the experimental reintroduction of native nemoral herbaceous species into young and mature woodlands of the Po Valley (Northern Italy), within peri-urban park 'Parco Nord Milano' (Lombardy, Italy), as well as a nearby natural control area within a mature forest in natural park 'Parco delle Groane' (Lombardy, Italy). The target species—Brachypodium sylvaticum (Huds.) *P. Beauv*. subsp. *sylvaticum*, *Carex pilosa* Scop., *Convallaria majalis* L., and *Vinca minor* L.—are native to the Lombardy region and were obtained from certified local propagation sources.
Approximately 800 individuals were divided into 32 plots of 1m² each, in three sites in 'Parco Nord Milano' and one site in 'Parco delle Groane', setting up, for each site, four replicates on the original soils only tilled, and four replicates on soils improved by the addition of high-quality topsoil. This will allow assessment of soil condition effects on plant establishment. The planting was completed at the end of March 2025 and the monitoring activity is scheduled to begin in the spring of the same year and will continue for at least five years. The monitoring activity will collect data about plant survival, vegetative and reproductive traits for each species (plant height, lateral growth, the number of flowers, and seed production).
This study could provide valuable insights into restoring the herbaceous component in artificial woodlands.

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Posters

Gut microbiota, microRNA and environmental factors: new perspectives for an in-depth analysis on the etiopathogenesis of IBD and IBS

Laura Restaneo[1,2], Sofia Remedia[1,2,3], Clarissa Gervasoni[1,2], S. Filardo[4], Chiara Ceriani[1,2,3], Alessia Lo Dico[1,2], R. Sessa[4], M. Cicala[5,6], M.P.L. Guarino[5,6], A. Altomare[7,5], G. Bertoli[1,2]

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The human exposome, encompassing lifelong environmental and lifestyle exposures, is increasingly recognized as a critical determinant of gut microbiota composition and intestinal homeostasis. In a translational One Health framework, this study investigated how dietary patterns and physical activity influence gut microbiota and intestinal barrier function in individuals with Inflammatory Bowel Disease (IBD), Irritable Bowel Syndrome (IBS), and healthy controls (HCs). A total of 130 participants were enrolled (38 IBD, 44 IBS, 48 HCs).
Microbial profiling was conducted via 16S rDNA V3/V4 region sequencing on the Illumina platform. Exposome assessment included a 7-day food diary, a validated Food Frequency Questionnaire, and the International Physical Activity Questionnaire (IPAQ). Urinary indican was measured using colorimetric assay and HPLC; fecal zonulin by ELISA; circulating microRNAs (miR-923, miR-221) by TaqMan qRT-PCR.IBD and IBS patients showed significantly reduced fiber intake ($p = 0.05$), while IBS patients reported higher moderate physical activity ($p = 0.05$). Low fiber intake correlated with decreased alpha diversity ($p = 0.005$). Microbiota composition differed among groups: IBD had the lowest diversity, IBS intermediate, and HCs the highest. Beta diversity confirmed distinct community structures.

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Posters

Gut microbiota, microRNA and environmental factors: new perspectives for an in-depth analysis on the etiopathogenesis of IBD and IBS

Laura Restaneo[1,2], Sofia Remedia[1,2,3], Clarissa Gervasoni[1,2], S. Filardo[4], Chiara Ceriani[1,2,3], Alessia Lo Dico[1,2], R. Sessa[4], M. Cicala[5,6], M.P.L. Guarino[5,6], A. Altomare[7,5], G. Bertoli[1,2]

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LEfSe identified the highest number of discriminant taxa in HCs, suggesting dysbiosis is linked to depletion of beneficial commensals. Rural residency correlated with higher microbial diversity. Non-adherence to the Mediterranean Diet was associated with increased fecal zonulin in IBD ($p = 0.001$) and IBS ($p = 0.003$). Specific miRNAs were deregulated in patients, supporting the role of exposome-related molecular signatures in personalized strategies for gut health.

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Posters

Spatio-Temporal Patterns of Faunal Activity in a Shallow Coralligenous Habitat Structured by the gorgonian *Paramuricea clavata*

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Paramuricea clavata (Risso, 1827) is a key species of the Mediterranean coralligenous assemblage. It plays a crucial role in structuring complex, three-dimensional habitats. Despite the extensive literature on the coralligenous, only a few studies have explored the medium to long-term temporal dynamics of its associated communities. This study aims to fill that gap by investigating the diversity, behaviour, and circadian rhythms of the fauna associated with a shallow *P. clavata* forest in the Ligurian Sea. An autonomous lander equipped with LED light and a time-lapse camera was deployed in July 2024 at 38 m on the flank of the Isuela Shoal (Zone B of the Portofino MPA). Monitoring was conducted over 39 days, resulting in 344 short videos recorded every two hours. The field of view (about 10 m²) was divided into three habitat layers: bottom, canopy, and overlying water. A total of 27 species were identified: four crustaceans (Malacostraca) and 23 fishes (Teleostei) belonging to 13 families. Sparidae and Labridae were the most represented. Most species showed differences in presence between day and night and distinct preferences for the habitat layers. In addition, the sleep/wake activity of *Chromis chromis* (Linnaeus, 1758), *Anthias anthias* (Linnaeus, 1758), and *Spicara smaris* (Linnaeus, 1758) was analysed, revealing varying spatial occupancy across the day. Finally, nocturnal colour changes ("pyjama pattern") were observed in *S. smaris* and *Dentex dentex* (Linnaeus, 1758). This study enhances understanding the spatio-temporal dynamics of coralligenous vagile fauna associated with habitat-forming gorgonians.

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Posters

Climate velocity for future-proofing biodiversity conservation in the Mediterranean Sea

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Climate change (CC) is significantly reshaping marine ecosystems, particularly by altering species distribution ranges, which poses challenges for conservation planning. Predictive metrics such as climate velocity can support conservation by identifying potential climate refugia – areas expected to maintain stable conditions and support biodiversity under future climate scenarios. Here we identified climate refugia in the Mediterranean Sea to evaluate the exposure to CC of Marine Protected Areas (MPAs) and Other Effective Conservation Measures (OECMs) as outlined in Italian maritime spatial plans. We computed climate velocity using the analogue-based approach and water column temperature data for two periods, 2006-2030 and 2031-2055. We classified refugia as areas projected to be stable (i.e., within the 10th percentile of climate velocity) and hotspots as areas that will experience significant change with potentially no analogs (i.e, climate velocity above the 90th percentile). By examining the spatial overlap of refugia and hotspots with designated MPAs and OECMs, we assessed their exposure to climate stressors and potential resilience. Our findings support a risk-based approach to conservation planning and contribute to making Italian maritime spatial planning more climate-smart and future-resilient.

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Posters

Histological analysis to assess fish health for sustainable aquaculture in the Ligurian Sea

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Given the increasing need to reduce or eliminate the use of chemicals (e.g. antibiotics) in aquaculture, it is essential to monitor the health status of fish in order to ensure the quality and sustainability of sea farms. Within the NBFC project (Spoke 2 - Solutions to reverse marine biodiversity loss and manage marine resources sustainably), a two-year monitoring of Sparus aurata was carried out, conducting monthly samplings to assess the health status of seabreams in different aquaculture conditions during their growth cycle (from 1 month-old fry to marketable size).
To achieve this, histopathological analysis techniques were applied on different tissues of the digestive system of fishes (spleen, liver and intestine). Samples were examined using a microscope and the images obtained were processed using image analysis tools to extract different types of information, which were statistically computed.
Preliminary results from spleen and liver analyses showed that the overall health status of fishes is good, and that differences between sampling periods are due to individual variability rather than seasonal variations. Future developments will focus on finalizing ongoing analyses on *S. aurata*, including analysis of *Dicentrarchus labrax* specimen and identifying the best methodology for estimating the condition of farmed fishes. The outcomes will provide feedback that will improve the monitoring and welfare of fish aquaculture and represent an important step towards sustainable aquaculture in Italy.

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Posters

The restoration process of *Posidonia oceanica* meadows: an environmental sustainability assessment

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Restoration ecology is an evolving science that provides models, methodologies and supporting tools for the restoration of ecosystems. In order to minimise both resources consumption and impacts of restoration processes, it is fundamental to assess its environmental sustainability. In this perspective it is necessary to use a whole system approach, able to evaluate the entire process as well as its phases or components. The aim of this research is to evaluate the sustainability performances of the restoration process of *Posidonia oceanica* ecosystem (Marine Ecosystem Restoration Prog-MARES project of Nature Biodiversity Future Center - NBFC). The study was performed using emergy analysis, an environmental accounting method based on thermodynamics able to quantify all the resources used to fulfil a process in a unique unit of measure: the equivalent solar energy (sej). Project developers were interviewed in order to make an inventory of the resources used for each phase of the restoration process. The main contribution consumptions were electricity, metals, manpower, and vegetal material from the donor meadow. Among accounted resources, about 75% are not renewable. The total physical resources requirement for a single intervention (considering 131 planted seedlings), including monitoring, is 1.78E+15 sej. It corresponds to 1.31E+13 sej/seedling. Results from this kind of evaluations allow: 1) making the restoration processes less impactful as possible and improving future interventions; 2) comparing different intervention options; and 3) communicating the importance of conservation effort of restored ecosystems.

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Posters

Monitoring and modelling of pathogen spillover from honey bees to wild bees

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The transmission of viral pathogens from honey bees (*Apis mellifera*) to wild pollinators has emerged as a concern for pollinator health and ecosystem stability. This study was designed to detect, characterize, and model virus spillover from managed honey bees (social source population) to bumblebees (wild social model) and solitary wild bees (non-social model), using molecular analyses of field-collected samples.

The first phase of this research involved active field sampling of individuals from the three focal bee groups across Sardinia. In parallel, floral resources were sampled to identify potential infection hotspots, focusing on plant species most frequently visited by pollinators. Sampling was conducted during the spring seasons of 2023 and 2024 at sites specifically selected for their contrasting hive densities, either high or low, to assess the influence of managed honey bee presence on virus transmission. The presence and viral load of two bee-associated viruses: Deformed Wing Virus (DWV, variants A and B) and Black Queen Cell Virus (BQCV); were determined through RNA extraction and quantitative PCR (Polymerase Chain Reaction).

The highest prevalence was observed for BQCV, followed by DWV-B, both detected in all groups. DWV-A had a very low prevalence, and was exclusive to honey bees.

Ongoing statistical analyses aim to investigate whether genetic affinities between species and hive density may have played a role in the observed patterns of pathogen spillover. These analyses will help elucidate the dynamics of viral transmission between managed and wild bee populations, contributing to a better understanding of the ecological implications for pollinator health.

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Posters

Exploration of the Italian flora: in vitro enzymatic screening assay for the discovery of potential new bioactive molecules

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Nowadays, non-communicable diseases represent one of the greatest challenges to global health and the scientific community is increasingly turning to nature for innovative solutions. Central, for this purpose, is the study of plants to discover new bioactive molecules that could help prevent and treat chronic diseases.
In recent years, medicinal and food plants and their bioactive compounds have gained attention as potential inhibitors of specific enzymes, such as α-glucosidase (α-GLU), cholinesterase, involved in diseases such as diabetes, neurodegenerative diseases and skin problems.
Enzyme inhibitors play, actually, a crucial role in the discovery of new drugs since the cause of many diseases is linked to the dysfunction, overexpression, or hyperactivation of specific enzymes. This work focused on the in vitro screening of 111 extracts of aerial parts of plants belonging to 47 different botanical families of the Italian flora to evaluate the potential hypoglycaemic activity (α-glucosidase assay) and to investigate selective potential neuroprotective capacity (acetylcholinesterase enzyme inhibition assay). Four plant species showed strong inhibitory activity on the enzyme AChE (IC50; 20 µg/mL), with values ranging from 5.6 to 10.2 µg/mL. In addition, 33 plant species showed strong inhibitory activity on the enzyme α-GLU (IC50; 50 µg/mL), with values ranging from 0.13 to 44.94 µg/mL.

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Posters

Two new species of Gastrotricha from an artificial freshwater pond

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Gastrotricha is a phylum of microscopic aquatic animals that includes over 900 species, with 375 of them residing in freshwater environments. Because of their rapid growth and ability to reproduce parthenogenetically, these creatures can quickly establish stable populations in any water body, starting from just one adult or a single egg. In fact, gastrotrichs can be found in nearly every aquatic or limno-terrestrial habitat, whether natural or artificial. Ponds in botanical gardens are man-made habitats that support diverse microfauna, including unnamed taxa. The introduction of animals through plant, water, and sediment replacement enhances their natural ability to sustain microscopic organisms. Aiming to shed light on gastrotrich diversity in these peculiar water reservoirs, we have performed a series of research studies. Here, we account for two new interesting species found in the main pond of Pisa's botanical garden. One species has a benthic lifestyle and shows the peculiar traits of the understudied *Chaetonotus macrolepidotus* species group, while the second, planktonic, belongs to the rare genus *Setopus*. The discovery of such disparity of life forms underscore the critical role of the botanical garden ponds in fostering a remarkable diversity of life forms.

Posters

The role of exposome for stratification of multimodal data in the One-Health Aging cohort

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Aging is a complex biological process and poses a growing societal burden. While chronological aging affects everyone, the trajectory of aging and the quality of life can vary significantly, influenced by the exposome.

As part of the project "Integrated innovative technologies for the development of a One-Health approach in the elderly population (One-Health Aging)", we developed an integrated approach with the main goal to define non-invasive biomarkers of healthy aging while exploring the influence of the exposome.

We collected multimodal data and biological samples from a cohort of 124 healthy individuals aged over 40. Collected data included personal data, lifestyle information, evaluation of general cognitive functioning, grip strength data, non-invasive skin imaging data and non-invasive biological samples (saliva, oral swabs and strip test) to analyze specific miRNAs and metabolites.

Lifestyle information was gathered though a questionnaire curated from the modules available in the EU SHARE project (Survey of Health, Ageing and Retirement in Europe). The questionnaire was developed and self-administered to the volunteers using EU survey platform.

Preliminary analysis showed that access to green areas and lower perceived pollution levels did not significantly impact behavioural risk factors such as dietary, smoking and physical activity choices. However, age and current employment status showed a significant association with smoking habits (age: $p=0.008$, employment status: $p= 0.016$), with a significant trend of smoking cessation at about 62 years ($p=0.026$).

Exposome data from this cohort will be used for subject stratification for subsequent multimodal data analysis aiming at the definition of healthy aging biomarkers.

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Posters

Reviving Biodiversity in the Venice Lagoon: Localized Strategies for Ecological, Social, and Economic Value Creation

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The Venice Lagoon is an especially complex socio-ecological system where biodiversity loss and habitat degradation had profound environmental and cultural impacts that constitute a threat to the future of Venice as a living city. We are here Venice ETS began the Vital initiative in 2020, bringing together local business, technical experts and academic advances with the aim of providing additionality in terms of biodiversity uplift and overall ecological functionality to complement public works in the lagoon, that tend to focus on infrastructural approaches to managing the lagoon, sediment disposal and hydraulic regulation. Vital's multidisciplinary approach provides insights to evaluating the effectiveness of restoration projects, combining the design and implementation of nature-based-solutions for wetland recreation with innovative monitoring techniques and biocultural indicators. Efforts have focused on pilot sites in the central lagoon, where most marshland reconstructions are located. A benchmarking method is applied for biodiversity that considers structural, functional, and taxonomic attributes at site and landscape levels. In parallel, biocultural diversity is used as a lens to assess how restoration outcomes resonate with local knowledge, identity, and traditional practices. This integrated approach enables the identification of "signs of effectiveness" that go beyond conventional metrics, providing actionable feedback for adaptive management. By aligning biodiversity recovery with socio-cultural values, Vital contributes to a holistic model of ecological restoration, relevant for urban coastal wetlands facing similar challenges. Our contribution to the NBFC highlights the strategic role of localized, evidence-based approaches in landscape-scale restoration, fostering resilience and supporting national and EU biodiversity and climate objectives.

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Posters

Wastewater and environmental waters as sentinels for environmental quality assessment in the one health framework

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Biodiversity monitoring is increasingly expanding to include microbial and viral components, which are essential to understanding ecosystem dynamics and potential risks to human and animal health. In this context, the analysis of wastewater and environmental waters is emerging as an effective, non-invasive tool to detect the presence of emerging and re-emerging viruses. By applying bioinformatic techniques to genomic data, it is possible to track the circulation of these pathogens in both human populations and the environment, often preceding clinical detection. This approach offers integrated insights into environmental quality, effectively serving as a litmus test for the health status of aquatic ecosystems.
In this study, we analysed the presence of H5N1 Avian Influenza Virus, SARS-CoV-2, and Poliovirus in different water matrices to assess environmental quality and detect early signs of anthropogenic pressure, ecological degradation, or biological risk. The spatial and temporal distribution patterns observed were closely linked to seasonal, geographic, and human-related factors. These results underscore the value of such environmental surveillance within the One Health framework, highlighting the importance of incorporating microbiological and virological data into biodiversity and water quality monitoring systems.
The comparison between environmental (aquatic) circulation and host-mediated circulation reveals that many of our pathogens are accumulating in aquatic environments. The relative ease of detecting them in such complex matrices suggests a high level of saturation, indicating the urgent need for corrective measures.

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Since the ultimate goal is to enhance prevention strategies and improve environmental risk management, continuous monitoring is essential to track trends and inform timely interventions.

Posters

Characterization and antimicrobial activity of extracts from microalgae *Chlorella sorokiniana* with green organic solvents

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Microalgae are involved in a variety of bioactive metabolites. They manifest a great variety of biological activities. The increasing demand for drugs able to cure new diseases resistant to commonly used medicines arouses interest in unconventional new sources of bioactive natural compounds. These latter ones are increasingly favored over synthetic ones for their lower environmental impact. However, extraction and characterization processes typically rely on harsh conditions and conventional solvents, which are unsustainable and cause pollution.
This study aimed to develop an eco-friendly extraction method to isolate and evaluate the antimicrobial properties of bioactive compounds from *Chlorella sorokiniana*. Using dimethyl carbonate, methoxycyclopentane, and butan-2-one (MEK) as green solvents alongside chloroform as a non-green reference solvent, on both untreated and sodium hydroxide pre-treated microalgae biomass, extract yields of up to 182 ± 27 mg/g DW were obtained using MEK. Extracts from untreated microalgae biomass exhibited lower MIC values compared to those obtained from pre-treated biomass, when tested as antimicrobial agents against Escherichia coli, Bacillus megaterium, and Bacillus subtilis. Principal component analysis highlighted correlations between GC-MS-identified compounds and antimicrobial activity.
The results underscore microalgae as a possible source of bioactive compounds in the pharmaceutical field.

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Posters

Green vs. Conventional Extraction: Toward Sustainable Bioactive Recovery

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The adoption of green extraction techniques offers a sustainable and efficient alternative to conventional methods for the recovery of bioactive compounds from plant matrices. In this study, Ceratonia siliqua leaves (CSL) were explored as valuable yet underutilized biomass sources. Based on their distinct metabolite profiles, Pressurized Hot Water Extraction (PHWE) and Ultrasound Probe Extraction (USprobe) were selected as green approaches for extracting its polar bioactive compounds. These techniques were compared to conventional methods such as Soxhlet (SO) and magnetic stirring-assisted maceration (SLE).
The green methods significantly reduced extraction time, 10- to 160-fold compared to SO and SLE and minimized ethanol consumption, with up to 3-fold less usage. Energy consumption was also markedly lower, especially with USprobe, which required 225 times less energy than SO. Furthermore, PHWE and USprobe allowed for exhaustive recovery of bioactive compounds, improved raw material valorization, and reduced environmental impact, aligning with the principles of green extraction. Both techniques maintained or even enhanced the biological activity (antioxidant and α-glucosidase inhibition) of the extracts when compared to traditional exhaustive methods such as ultrasound bath-assisted extraction (USbath).
Overall, PHWE and USprobe demonstrated comparable extraction efficiency and extract quality to conventional techniques, with the added benefits of process simplification, lower environmental footprint, and scalability. While PHWE is fully automated and avoids filtration or solvent recovery steps, it requires higher energy input than USprobe. These findings confirm green extraction as a viable and superior alternative for sustainable industrial applications.

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Posters

Exploring yeast biodiversity and process conditions for optimizing ethylene glycol conversion into glycolic acid

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Plastics have become an indispensable material in many fields of human activities, with production increasing every year; however, most of the plastic waste is still incinerated or landfilled, and only 10% of the new plastic is recycled even once. Among all plastics, polyethylene terephthalate (PET) is the most produced polyester worldwide; ethylene glycol (EG) is one of the two monomers released by the bio-recycling of PET. While most research focuses on bacterial EG metabolism, this work reports the ability of *Saccharomyces cerevisiae* and nine other common laboratory yeast species not only to consume EG, but also to produce glycolic acid (GA) as the main by-product. A two-step bioconversion of EG to GA by *S. cerevisiae* was optimized by a design of experiment approach, obtaining 4.51 ± 0.12 g L−1 of GA with a conversion of 94.25 ± 1.74% from 6.21 ± 0.04 g L−1 EG. To improve the titer, screening of yeast biodiversity identified Scheffersomyces stipitis as the best GA producer, obtaining 23.79 ± 1.19 g L−1 of GA (yield 76.68%) in bioreactor fermentation, with a single-step bioprocess. Our findings contribute in laying the ground for EG upcycling strategies with yeasts.

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Posters

Succisa pratensis: A Natural Enhancer of Chemotherapy in Glioblastoma

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Glioblastoma multiforme (GBM) is an aggressive brain tumor with a poor prognosis and frequent resistance to standard treatments, including Temozolomide (TMZ). New therapeutic strategies are urgently needed to overcome these limitations. Natural biodiversity represents a valuable source of bioactive compounds with anticancer activity. This study investigates the therapeutic potential of *Succisa pratensis* and its ability to impair the nuclear receptor Pregnane X Receptor (PXR), promoting sensitivity in GBM cells to TMZ. The efficacy of *S. pratensis* extract, in combination with TMZ, was tested on TMZ-resistant GBM cell lines. A multidisciplinary in vitro approach was used to assess cell proliferation and cell mortality, colony formation, and migration potential. The whole extract was characterized by liquid chromatography-mass spectrometry, and molecular docking was performed to evaluate the binding of identified metabolites to PXR. PXR expression and activity were analysed using qPCR and immunofluorescence. Combined treatment significantly reduced cell proliferation, colony formation, and migratory capacity compared to controls. Although PXR expression increased upon treatment, no parallel induction of its target genes was observed, suggesting functional inhibition. Docking analysis revealed that specific *S. pratensis* metabolites showed high affinity for the PXR ligand-binding domain, potentially acting as antagonists.
These findings suggest that *S. pratensis* extract, and particularly its secondary metabolites, may serve as PXR modulators and adjuvants to TMZ therapy, helping to overcome chemoresistance in GBM. Further studies in preclinical models and patient-derived cells are necessary to confirm these promising results.

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Posters

Enhancing the ecological value of urban green areas: a case study from the Life CityAdaP3 Project

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This study is part of the European Life CityAdaP3 project, led by the Municipality of Reggio Emilia (Italy). It promotes “adaptive parks”—urban green spaces designed to enhance resilience, biodiversity and climate adaptability. "Marco Biagi Park" served as the pilot site, featuring the creation of two micro-forests, rural hedgerows, tree rows, and a semi-humid zone. An artificial pond and a channel were realized to mimic a wetland habitat. Micro-forests were established using the Miyawaki method, which supports rapid growth and biodiversity: a native micro-forest (NF), with species typical of the Po Valley woodlands, and an adaptive micro-forest (AF), including some Mediterranean species suited to future climate conditions.

Environmental monitoring began after the 2022 intervention. By 2025, the introduced hydrophyte species—such as *Lemna minor, Mentha aquatica, Nymphaea alba, Typha latifolia* and others—had increased in population. Vegetation surveys conducted in 2024 and 2025 using Braun-Blanquet and transect methods around the banks of channel, revealed the occurrence of 13 new herbaceous species. Pond hosted more hydrophytes (19%) and scapose species (23%) than the channel, which had more rooting species (8%). The pond also favoured Eurasian species (39%), while the channel had more cosmopolitan ones (29%). Both forests showed positive Relative Growth Rates from 2024 to 2025: AF (+0.46%) and NF (+0.19%). However, the AF experienced higher plant mortality between 2022 to 2025 compared to NF, particularly shrubs. These early findings highlight the potential of naturalization strategies in urban parks to improve ecological quality, increase plant biodiversity and strengthen the environmental resilience.

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Posters

The Power of Pollinators: How Insect Pollination Shapes the Phytochemical Profile of Berries

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Pollination is a vital ecosystem service that supports biodiversity and global food security. It plays a key role in plant reproduction, fruit development, and seed dispersal. Research has shown that pollinators are essential not only for agricultural productivity and healthy ecosystems but also influence the nutritional quality of food crops [1]. This study aims to explore how insect pollination, both in controlled environments and human-altered landscapes, influences the nutrient content and secondary metabolites in berries. The experimental design focused on two species from the Rubus genus: blackberries (varieties Lock Ness and Duchessa) and raspberries (varieties Prima Alba, Rossana, Regina, Autumn Bliss, and Amira). This study permitted to investigate the effects of self and insect-mediated pollination on fruit chemical profile. The profile and level of secondary metabolites were analyzed using untargeted UHPLC-DAD-HRMS/MS, combined with a chemometric approach. This method demonstrated strong predictive capability, allowing for clear differentiation between the various categories studied. Key compounds of interest included anthocyanins, quercetin and kaempferol derivatives, hydroxycinnamic acid derivatives, gallotannins, and ellagitannins. The results indicated that all plant species showed enhanced phytochemical profiles following insect-mediated pollination. This finding has significant implications for both ecological dynamics and human health, highlighting the complex and essential relationship between pollinators, plant biochemistry, and the nutritional quality food.

[1] Pardo, A., & Borges, P. A. (2020). Worldwide importance of insect pollination in apple orchards: A review. Agriculture, Ecosystems & Environment, 293, 106839.

Posters

Insight into the ecotoxicological effects of plastic particles on marine biodiversity: planned activity in the Gulf of La Spezia, Italy

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The adverse effects of plastics on marine organisms extend beyond physical harm and are also linked to the chemical cocktail leached into the aquatic environment. Studies have shown that leachates from conventional (PP, PE, PS) and bio-based (Mater-Bi) plastic bags are toxic to marine organisms even at low concentrations, with polyethylene (PE) showing the highest toxicity. A key concern is the accumulation of plastics and associated contaminants along the river-to-sea continuum, especially in semi-enclosed, low-energy coastal systems that act as natural sinks. This is particularly relevant in the Ligurian region, where hydrodynamic conditions support both biodiversity and contaminant retention. The Gulf of La Spezia and the Magra River delta have been selected as case studies to investigate the ecotoxicological impact of weathered plastic leachates on marine ecosystems.

Water and sediment samples will be collected at selected sites in La Spezia Gulf and Magra River mouth using corers and grab samplers. Sediment cores will be analyzed for radionuclides to estimate sedimentation rates and recent contamination. A bioassay battery using *Aliivibrio fischeri, Dunaliella tertiolecta,* and *Artemia salina* will be applied to assess eco(toxico)logical risks in both matrices. Passive samplers will be deployed to detect trace contaminants.

Plastics and microplastics presence in sediments will be evaluated before testing their leachates. Sediment cores will be used to characterize plastic contamination and reconstruct depositional timelines providing insights into pollution trends and ecosystem vulnerability. This multidisciplinary approach, combining chemical analysis, ecotoxicological testing, and ecological risk assessment, is essential to understanding long-term impacts and supporting biodiversity conservation.

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Posters

Variation in pollinator assemblage along a rural-urban gradient does not affect fruit and seed set in a Mediterranean generalist plant species

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Land use change is known to deeply affect plant–pollinator interactions and rural–urban gradients offer useful models for assessing the effects of anthropogenic activity on these interactions.
Here, we surveyed pollinators and two metrics of plant reproductive success (i.e., fruits/flowers and seeds per fruit) of *Raphanus raphanistrum* in 17 populations in three land cover classes (seminatural, agricultural and urban) defining a Mediterranean rural-urban gradient. We built plant-pollinator networks and calculated the total number of pollinator visits, the relative contribution of different wild pollinator categories and of wild vs. managed pollinators. Then, we estimated the contribution of different pollinator functional traits in the three land cover classes. Lastly, we tested the effect of pollinator assemblage and pollinator abundance on plant reproductive success.
Our results show that *R. raphanistrum* employs a highly generalist strategy. However, in urban areas we found a lower diversity of pollinators. Wild pollinator assemblage varies; with Syrphidae being prevalent in seminatural areas, Pieridae in agricultural areas and Halictidae in urban areas. Honeybees contributed equally to pollination in agricultural areas whilst wild pollinators were predominant in urban and seminatural areas. Similarly, pollinator functional traits varied along the rural-urban gradient. Total number of pollinator visits was, instead, comparable likely explaining the similar levels of plant reproductive success along the gradient.
Our findings suggest that urbanization can alter pollinator assemblage, but generalist plant species might maintain stable reproductive success by leveraging a broad range of pollinators. This resilience underscores the potential for generalist species to persist in changing environments.

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Posters

From biodiversity to ecosystem functions: modeling approaches within the NBFC Digital Platform

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The NBFC Digital Platform was established to bridge gaps between requirements of the scientific community and availability of modeling tools, datasets, and computational resources, with a particular emphasis on Biodiversity and Ecosystem Functions (BEF). The platform integrates a suite of advanced models targeting various aspects of biodiversity and ecosystem processes. Key modeling tools include HMSC, FEM, and CLM. The Forest Ecosystem Module (FEM) simulates the dynamics of carbon, nitrogen, energy, and water fluxes, along with the allocation of C and N, in both homogeneous and heterogeneous forest stands, incorporating species composition, tree age, Diameter at Breast height, height, and management strategies. The Hierarchical Modeling of Species Communities (HMSC), a joint species distribution model (JSDM), combines species occurrence data, environmental variables, functional traits, and phylogeny to describe and predict community assembly patterns. National forest inventories' data can be used as an informative layer for this class of models. The Community Land Model (CLM), a core component of the Community Earth System Model (CESM), provides a detailed representation of ecological and biophysical surface processes, including carbon, water, and energy cycling, vegetation-atmosphere interactions, and the impacts of climate and land-use changes. CLM enables the simulation of ecosystem dynamics across regional to global scales, offering a comprehensive framework for assessing environmental responses to natural and anthropogenic drivers. By integrating diverse modeling approaches, tailored to use HPC resources, the NBFC Platform provides a comprehensive framework to support cutting-edge research on Biodiversity and Ecosystem Functions across multiple scales.

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Posters

Applying a regulation-based classification to sicilian Marine Protected Areas

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Marine Protected Areas (MPAs) are considered worldwide as a key tool for conserving marine ecosystems, protecting biodiversity and promoting sustainable resource use and societal well-being. However, the effectiveness of MPAs varies greatly, often due to differing regulatory schemes and rule enforcement, which makes it challenging in evaluating progress towards the targets of the EU Biodiversity Strategy and in providing consistent management guidance. Using the regulation-based classification framework developed by Horta e Costa et al. (2016), we assessed MPAs around the Sicilian coast to evaluate variability in regulatory schemes among the different zones of the MPAs, thereby helping to explain differences in MPA effectiveness for ecological conservation outcomes. We selected Sicilian MPAs for which detailed regulatory data were available, allowing us to analyse and compare rules at both the MPA-wide and zone-specific levels. For any given zone, a score was assigned to each use (i.e. commercial fisheries, recreational fisheries, aquaculture, bottom exploitation and non-extractive uses), weighted by mitigation measures, and a zone class was assigned using a 4-step decision tree. Zone scores were averaged weighting by the area of each zone to compute an overall MPA score. All Sicilian MPAs including their partially protected zones got the same MPA score (Highly Protected) and zone class, i.e. Moderately regulated extraction, except for the Islands MPA, which was downgraded to 'Moderately Protected', due to lower fisheries restrictions in the zone with the weakest protection. These results reflect the frequent use of similar regulations across Sicilian MPAs leading to consistent zone classifications among them.

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Posters

Man-made contaminants in Svalbard's Kongsfjorden (Svalbard Archipelago, Norway): a multi-faceted risk assessment

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Pharmaceuticals and personal care products (PPCPs) are emerging contaminants increasingly detected in marine environments, including remote Arctic regions, which act as early-warning systems for assessing the global impacts of pollution. Despite their ecological significance, Arctic marine ecosystems are particularly vulnerable due to limited wastewater treatments, cold temperatures, and environmental conditions that slow contaminant natural degradation and enhance persistence.
This study provides the first multi-year dataset (2018–2022) on the presence of 17 PPCPs, spanning various therapeutic classes (i.e., antibiotics, anti-inflammatories, antipyretics, anticonvulsants, stimulants, insect repellents, disinfectants, and hormones), in surface seawater from Kongsfjorden (KF, Svalbard, Norway; 79°00’N, 11°40’E). Samples were collected along a transect covering sites with varying human activity. Effluents from Ny-Ålesund’s wastewater treatment plant, on KF’s southern shore, were also analyzed to distinguish local from external sources. PPCP concentrations matched urban levels, revealing growing human influence in the Arctic. Environmental risk assessment (ERA) indicated medium to high risks for benthic organisms, with antibiotics raising additional concerns over antimicrobial resistance. Mixture risk assessment further underscored that contaminant combinations can compromise the health of aquatic organisms across trophic levels, disrupt endocrine and hormonal functions, and potentially enhance antibiotic resistance.
These findings establish a baseline for PPCP contamination in Arctic waters and emphasize the urgent need for continued monitoring, improved wastewater infrastructure, and the integration of Arctic data into global pollution management and policy strategies—particularly in the context of climate change and increasing human activity in polar regions—to protect the biodiversity of these sensitive and unique ecosystems.

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Posters

Biodiversity in mushroom: the remarkable case of saponaceolides and terreolides, secondary metabolites from the *Tricholoma genus*

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Saponaceolides and terreolides are two groups of structurally related triterpenes isolated from mushroom species belonging to the *Tricholoma* genus. Due to their high bioactivity, these compounds have drawn widespread attention, both for their potential application as antitumor drugs and for the concerns raised by their presence in edible mushrooms. We investigated the presence of terreolides and saponaceolides in *Tricholoma terreum* samples of different geographical origin. No evidence was found, in the fruiting bodies, of terreolides, terreumols or saponaceolides H-S, in striking contrast with the isolation of these terpenoids by mushroom collected in France and identified as *T. terreum*. The main cytotoxic terpenoid identified and isolated from the extracts of the specimens investigated in this work was the C30 derivative saponaceolide B, which had been previously isolated from *T. saponaceum* and other *T. terreum* collections. Considered together, these findings point to the need for the unambiguous identification of mushroom species belonging to the complex genus *Tricholoma*, characterized by high variability in the composition of metabolites. Moreover, based on our data, *T. terreum* must be considered an edible mushroom.

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Posters

Social-Ecological System Frameworks to connect knowledge systems' and perspectives on ecosystem services toward an equitable ocean governance

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Small-Scale Fisheries (SSF) are often overlooked in policy-making, despite their recognized role as holders of Local Ecological Knowledge (LEK), highlighted by numerous international studies. LEK and SSFs' comprehension are key to efficient Marine Spatial Planning (MSP) and sustainable ocean governance, in a way that does not consider biodiversity merely as a resource to exploit, but as an inherent source of well-being, through its ability to provide ecosystem goods and services to coastal communities.

The Social-Ecological Systems Framework (SESF) has emerged as a comprehensive tool for diagnosing interactions and outcomes within transformative ocean governance contexts, particularly regarding SSF-related socio-ecological systems (SES). SESF offers a transdisciplinary lens to capture the complex dynamics among diverse coastal stakeholders - such as tourism operators and conservation initiatives - especially within insular and coastal SES.

This three-year study will apply the SESF approach to the Mediterranean Basin - a spatially limited but highly diverse seascape - aiming to assess the needs and interactions among key stakeholders in coastal communities, including SSF, various tourism models and marine conservation efforts (e.g., Marine Protected Areas and alternative tools).

Combining social science methodologies - such as semi-structured interviews, surveys and focus groups - with participatory research and existing bio-ecological and economic data, this study aims to construct a detailed understanding of recurrent coastal SES across selected case studies.

The overarching objective is to connect diverse knowledge systems to achieve a complete view of the drivers influencing ecosystem services and biodiversity in coastal areas.

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Posters

miRExplorer: a Shiny app to investigate miRNA-disease and miRNA-gene associations

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MicroRNAs (miRNAs) are small non-coding RNAs that regulate gene expression and are involved in biological processes such as cell differentiation, apoptosis, and tumorigenesis. Their presence in circulating body fluids, including blood, saliva, and urine, highlights their potential as biomarkers for various diseases. To support research in this area, numerous computational tools have been developed to explore miRNA-gene and miRNA-disease associations. However, many of these tools have limitations in terms of usability, depth of information, and integration of diverse data types.

To address these gaps, we present miRExplorer, a novel tool designed for comprehensive miRNA analysis. miRExplorer allows users to investigate miRNA-disease, miRNA-gene and miRNA-Gene-Protein-Reaction associations, as well as explore complex networks involving genes, proteins, and biochemical reactions. The platform also includes an over-representation analysis module to identify significantly enriched biological pathways associated with specific miRNAs.

One of the key innovations of miRExplorer is its incorporation of disease-specific information and evidence-based filtering of miRNA-target interactions enabling a robust and insightful analysis for miRNA-based biomarker studies.

By combining an intuitive interface with powerful analytical capabilities, miRExplorer empowers researchers to conduct in-depth analyses of miRNA functions and their potential as biomarkers. This tool represents a significant step forward in facilitating the exploration of complex molecular interactions and advancing the study of miRNA-related mechanisms in health and disease.

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Posters

BIOURBAN-IMON: Nuovi strumenti automatizzati per il monitoraggio della biodiversità funzionale e delle specie invasive in ambiente urbano

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The BIOURBAN-IMON project, in the framework of Spoke 5, aims to develop, validate and apply an integrated multi-taxa approach for the automated monitoring of biodiversity in urban environments. The main objective is to develop a tool that combines airborne eDNA metabarcoding with spatial analysis techniques to generate distribution maps of invasive alien species (IAS) and species of conservation interest, as well as maps of potential specific richness.

The project involves the validation of specially designed filtration systems and the use of filters from PM10 (ARPA) stations for indirect fauna monitoring using eDNA, supplemented by qPCR probes for the detection of individual target species. Reference genetic databases for Italian vertebrates will also be set up, filling the current gaps thanks to existing biobanks.

A further objective is the validation of a tool for the production of urban biodiversity maps, useful for identifying areas of high diversity, areas at risk for the presence of IAS, or key areas for sustainable urban planning. High-resolution spatial databases with national and European coverage will be used, ensuring the transferability of the method. Satellite imagery will be selected on the basis of European availability, while multi-source data (atlases, citizen science, geo-referenced eDNA) will be harmonised with high-resolution (10 m) ecogeographic variables to generate Species Distribution Models (SDM) in urban settings.

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Lignin-based polymer materials designed for sorptive extraction of xenobiotic compounds in water samples

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Biomass represents a crucial renewable resource in the global transition toward a circular and sustainable economy. Its valorization offers a strategic approach both to reduce dependence on non-renewable fossil resources and to develop new materials with advanced functionalities. In this context, lignocellulosic biomass plays a prominent role due to its unique properties, including high thermal stability, mechanical strength, and the ability to interact with a wide range of organic molecules. Given these characteristics, the development of lignin-based materials enables the possibility to produce novel sorbents aimed to remove pharmaceuticals, and other xenobiotics from environmental samples.
Accordingly, lignin isolated from hardwood biomasses was polymerized via a free radical polymerization to obtain two different lignin-based polymeric materials. The resulting co-polymers were first characterized from a structural, chemical and thermal perspectives using ATR-IR spectroscopy, Py-GC/MS, DSC and TGA to rationalize their performance in the adsorption experiments.
Realized materials were tested in different aqueous environments spiked with contaminants belonging to different chemical classes and with varying physicochemical properties. Carbamazepine, sildenafil citrate and oxybenzone were selected as model compounds due to their massive presence in environmental systems and their known endocrine-disrupting effects. Adsorption tests were carried out in static and dynamic conditions to mimic the real environmental conditions. Quantification of the adsorbed compounds was performed using LC-MS. Preliminary results indicate that the synthesized polymeric materials were effective in extracting the selected compounds, with performance varying based on material composition. Future goals will include exploring additional polymerization approaches to enhance selectivity for specific contaminant classes.

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Phylogenetic Approach to Prioritize Medicinal Plant Discovery

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Discovering beneficial molecules in plants is a complex task requiring significant time and resources. To streamline this process, a strategic approach is essential for initially identifying plants with high potential. A promising strategy involves phylogenetics, as closely related plant species tend to share biochemistry. The aim is to propose a pipeline of phylogenetic methods to identify plants most likely to contain beneficial molecules. In this study, we extracted five monophyletic subtrees from a phylogenetic tree containing 32.223 species sourced from literature. Medicinal plant data, linked to disease, biological activity, or ethnobotanical use, were gathered from three databases. All the data for all the subtrees were subject to a series of phylogenetic methods. The results identified the "hot nodes", nodes related to the plants with most potential, and the subtree descending from these nodes were plotted. This study demonstrates the efficacy of phylogenetic methodologies in prioritizing plants for their medicinal potential.

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Dynamics of high-resolution global environmental stratification under climate change

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Climate change is significantly altering the Earth's bioclimatic regions, leading to serious impacts on ecosystems, biodiversity, farming, and human health. In this work, we describe a globally consistent high-resolution assessment of projected shifts in terrestrial bioclimatic zones by utilizing a Environmental Stratification (EnS) approach applied to multi-model ensembles from CMIP6 Earth System Models (ESMs). The EnS method combines several essential climatic and biophysical factors and clusters these into ecologically understandable strata, depicting spatial climate-induced dynamics following climate changes over various temporal and geographic scales. Our study shows extensive migration of bioclimatic zones toward the poles and higher elevations, with a reduction in cold and mesic areas, and an increase in hotter and drier zones by the middle of the century. Under high-emission scenarios, boreal zones move northward by more than 2° of latitude, while montane zones shift upward by 250–320 meters, exhibiting elevational altitudinal upward shifts at speed of 4.5–5.8 m/year. These trends generally align with observed empirical data.
The EnS framework provides a robust and adaptable tool for recognizing ecologically significant impacts of climate change over ecosystem shifts, aiding in various applications such as conservation planning, ecosystem-based adaptation, and regional climate risk evaluation. Although this study provides a worldwide perspective, it also emphasizes the usefulness of the EnS framework at local-to-regional levels, where it can inform spatially specific, climate-resilient choices. Our results highlight the need to incorporate climate-informed ecological zonation into planning and policy processes as terrestrial systems face a period of rapid environmental transformation.

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Posters

Evaluating postfire soil recovery in pine and chestnut forests under Mediterranean climate

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Wildfires, especially of anthropic origins, threated the ecosystem health with consequences on soil properties and functionality. The application of remote sensing tools and the selection of specific soil indicators might contribute to better quantify the soil degradation and to assess post-fire ecosystem recovery. The aim of the study was the selection of suitable post-fire soil indicators that, coupled with remote sensing, can allow the monitoring of ecosystem restoration in Mediterranean forests. For this purpose, two naturaliform forest types (pine and chestnut) were selected on Monte Pisano (Italy), hit by a destructive fire event in September 2018, and monitored over time by remote sensing. In each forest type, burned and unburned sites were compared in terms of soil properties, mycorrhizal abundance, stable isotopes, and enzyme activities after two (2020) and five (2023) years from the fire event. The satellite data and soil texture indicated a higher fire impact and a slower vegetation recovery in pine site compared to the chestnut one. In agreement, the soil stable isotope composition and soil enzyme activities indicated a deterioration of soil organic matter composition and nutrient cycling, especially in pine site. Moreover, the pine soil showed a lower mycorrhizal colonization after fire than the chestnut soil. In conclusion, soil enzymes, N stable isotope and mycorrhizal colonization were sensitive indicators of postfire recovery and, coupled with satellite data, have shown to be useful tools for monitoring the progress in natural restoration of ecosystem functionality.

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Posters

Characterizing the pelagic megafauna of two seamounts in the Tyrrhenian Sea

Gabriele Turco [1,2], Giulia Bressan [1,2], Desirée Grancagnolo [1,2], Federico Quattrocchi [1,2], Carlo Cattano [1,3], Andrea Miccoli [1,4], Fabio Campanella [1,4], Marco Milazzo [1,2]

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The complex topographic, oceanographic and trophic processes occurring around seamounts make them potential ecological hotspots for pelagic megafauna. Within the framework of the PELASeam campaign (July-August 2024), we deployed 44 pelagic Baited Remote Underwater Video (pBRUV) systems at -25m to characterise the pelagic megafauna of two different seamounts in the central and NW Tyrrhenian Sea: the Vavilov (VAV) (volcanic, base -3150m, peak -730m) and the Vercelli (VER) (granitic, base -1010m; peak -70m). The maximum number of individuals observed in a single frame (MaxN) and the number of species were obtained from each 4h video recorded over areas with distinct topographic and bathymetry features: summit (VAV: -1264 m; VER: -366 m), slope (VAV: -2464 m; VER: -1009 m). Data were then compared with values recorded from pBRUVs deployed over the abyssal plain (i.e. reference zones; VAV: -3593 m; VER: -1735 m). VAV supported a less diverse megafaunal assemblage, with the blue shark *Prionace glauca* and the loggerhead *Caretta caretta* primarily recorded in the slope and in the reference zones. The blue shark, the shortfin mako *Isurus oxyrinchus*, the Atlantic bluefin *Thunnus thynnus* and the *Albacore Thunnus* alalunga were recurrent over the slope and the summit zones of VER, while no megafauna was observed in its reference zones. Our pBRUV surveys indicate that these two seamounts host different highly endangered megafaunal species. These preliminary data highlight the key role of seamount features in attracting pelagic megafauna with high occurrences, also underlining the importance of protecting the water column of these open-sea systems.

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Posters

Technologies for marine biodiversity monitoring and mapping: a systematic review

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Recent advances in robotics, artificial intelligence, remote sensing, and smart sensors are transforming scientific research, with significant impacts on marine biology and ecology. These technologies allow scientists to explore previously inaccessible environments and accurately characterize marine habitats. Since much of this innovation is driven by the private sector, it is essential to evaluate the applicability of these tools in ecological research, balancing scientific objectives with cost-effectiveness, sustainability, and technological obsolescence, while recognizing the ongoing contributions of the scientific community.
In this study, we conducted a systematic literature review following PRISMA guidelines. We screened 1,028 publications retrieved from Scopus, Web of Science, and Google Scholar, and selected 167 articles that specifically addressed technologies currently available on the market or in advanced research stages. The review highlights the growing use of adaptable instruments, such as underwater cameras and autonomous underwater vehicles (AUVs), which are increasingly employed in diverse marine conditions. Additionally, it emphasizes the role of specialized tools, including remotely operated vehicles (ROVs) and hydrophones, particularly useful for monitoring fish and marine mammal populations.
Despite these promising developments, widespread adoption of such technologies is still limited by high costs and funding constraints. This hinders long-term ecological monitoring and broader implementation across different regions and research programs. Therefore, identifying more affordable and scalable technological solutions is a priority for the field. Overcoming these barriers will be essential to improving future biodiversity monitoring, supporting conservation strategies, and enabling more robust assessments of marine ecosystems on both local and global scales.

Posters

Spatial patterns of *Posidonia oceanica* in the Oristano Gulf (Sardinia Island, Italy) detected with hyperspectral satellite data and geospatial modelling

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The assessment of the protective value offered by different coastal ecosystems (e.g., wetlands, beach dunes, seagrasses) is an attempt to connect biophysical assets in coastal systems to the value of ecosystem services. Due to increasing exposure to multiple natural pressures (e.g., sea level rise and related hazards), seagrasses rank among the most relevant ecosystems of the Mediterranean sea.
The identification of *Posidonia oceanica* meadows spatial patterns, such as degree of coverage, upper limit position, fragmentation and proximity to the coastline, are all indicators suitable for quantifying the potential of these marine ecosystems in coastal protection.
Hyperspectral satellite data, such as these acquired by PRISMA and EnMap, integrated with field observations, have provided an unprecedented opportunity to map seabed habitats in the Gulf of Oristano (Sardinia, Italy).
Thematic classification products delineate sandy and vegetated seabeds with an accuracy of 68% for *P. oceanica* meadows estimating approximately 31 km2 of densely covered meadow out of a total extent of 50 km2. Furthermore, seagrass presence is accurately retrieved down to a bathymetric depth of 8 m. This retrieval depth is enabled by the high spectral resolution of hyperspectral imagery while being inherently limited by the optical attenuation properties of the water column.
Spatial patterns indicators of the seabed are used as graphs-based network, with nodes and links, to identify the ecological capacity of *P. oceanica* patches to provide coastal protection.The product, being the most up-to-date (May 2024) for the area, supports a variety of studies on coastal resilience, vulnerability and protection.

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Posters

Effects of windstorm Vaia on soil carbon sequestration and nutrient cycling

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Climate change has increased the frequency of extreme events with potentially severe economic and environmental impacts at the local and national levels. In 2018, the windstorm VAIA hit north-eastern Italy, affecting about 45 kha of forest areas and causing more than 12 million m3 of timber loss. A high severity wind disturbance can affect the functionality of forests and alter the ecosystem services provisioning, including the soil health and its ability to mitigate climate change through carbon sequestration. In this study, the effect of windstorm on soil health was evaluated with a special focus on soil carbon sequestration and nutrient cycling. For this purpose, C-, N- and P-related enzyme activities, aggregate stability and organic carbon fractionation were investigated in soil of a post-Vaia site on Asiago plateau (Italy). The soil samples were collected in a windthrown area along a transect starting from the intact forest edge, characterized by a spontaneous plant succession. Preliminary results indicated that the windstorm affected the soil health through an alteration of soil nutrient cycles, as highlighted by the increase of enzyme activities related to nutrient acquisition. In addition, the soil aggregate stability decreased along the transect, probably due to changes in soil organic matter content. The study of soil health in post-windthrow sites contributes to the implementation of proper restoration actions for the recovery of forest ecosystems and the related ecosystem services.

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Posters

Traits of ornamental non-native trees across seven Italian cities

Marco Varricchione[1,2], Nicole Sebesta*[3], Elena Barni[2,3], Giulio Barone [2,4], Maria Laura Carranza[1,2], Laura Celesti-Grapow[2,5], Sandra Citterio[2,6], Giulia Daniele[2,7], Emilio Di Gristin[4], Federica Larcher[2,7], Chiara Montagnani[2,6], Lucia Antonietta Santoianni[1,8], Emanuele Vegini[2,6], Giuseppe Venturella[2,4], Angela Stanisci[1,2]*

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Ornamental non-native trees play a crucial role in urban landscapes, traditionally enhancing aesthetic value and providing many ecosystem services. However, they may pose an environmental risk as several species introduced for ornamental purposes have become invasive.

The present study introduces the database ATENA (dATabase of ornamEntal non-NAtive trees in seven Italian cities), a comprehensive dataset that includes taxonomic information, ecological traits and indicators of non-native ornamental trees of public spaces. It aims to support urban greenery and sustainable urban planning. The database was created from species lists from seven representative Italian cities: Milan, Turin, Asti, Pavia, Rome, Campobasso, and Palermo.

Currently, the list includes 318 plant taxa from 72 families, with most originating from temperate Asia, Northern America, and tropical Asia. Zoochory emerged as the dominant dispersal mechanism, followed by anemochory and unspecialized modes. Notably, Palermo hosts a unique ornamental non-native flora compared to other cities, as many ornamental non-native species were recorded only there.

Our findings revealed that 53.4% of the species are alien (7.5% of these are invasive).

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Two cultivated species are invasive species of European Union concern. Considering the well-documented negative impacts these species can have on native biodiversity, results highlight the environmental risks associated with planting non-native species that are invasive or potentially invasive.
The ATENA database will be open to integrations from other cities to offer an increasingly comprehensive set of species and their ecological and distribution features to assist in preventing the introduction of problematic species while fostering more sustainable urban planting practices.

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Posters

Multi-taxon diversity monitoring in a restored shallow landslide in Tuscany

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This study focuses on the long-term evolution of slope stability and multi-taxon biodiversity in a shallow landslide in Tuscany, Italy, restored in 1998 with SWBE techniques.
Microorganisms play a vital role in the recovery of landslides and eroded soils by aiding in soil stabilization and regeneration. By supporting plant life and improving soil health, microorganisms contribute significantly to the restoration of degraded, landslide-prone areas.
The aim of this study was the evaluation of diversity in field surveys conducted since 2013 by examining vegetation succession, soil cohesion, and biodiversity complexity, with a focus on microbial diversity, in the restored area.
A functional characterization of the microbial community was performed by shotgun metagenomics. Total DNA was extracted using the FastDNA™ SPIN Kit for Soil. DNA quantity was measured by Qubit and sequencing was performed using an Illumina NovaSeq using a 150x2 bp protocol. A total of 451 GB (from 11 to 33 GB per sample) were obtained. Changes in diversity and metabolic functionality of soil bacterial microbial communities were also investigated combining Phenotype Macroarray analysis with Ecoplate and shotgun metagenomics.
Our findings underscore the ecological and technical benefits of SWBE techniques, which ensure slope stability over time but enhance quantitative biodiversity. Multi-taxon diversity monitoring in shallow landslide restoration provides insights into the ecological effectiveness of nature-based solutions in degraded environments. Further interdisciplinary research on the effects of different SWBE techniques on ecological restoration is needed to emphasise their potential to merge geotechnical stability with long-term biodiversity gains.

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Posters

Science on the move: 3 years of Cammini LTER bridging research on biodiversity and communities

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The Cammini initiative, designed by researchers from the LTER (Long Term Ecological Research) Italy network, is an informal science communication initiative aimed to promote biodiversity awareness, sharing research experiences, and strengthening connections between local communities and scientists. It emphasizes the collective responsibility of caring for ecosystems and biodiversity, promoting cooperation among residents, managers, and researchers.

The 2023 - 2025 editions, specifically dedicated to fostering awareness towards biodiversity loss and richness, connected several LTER research sites in the Italian landscape, by foot, bicycle, or kayak, engaging in public events, data collection, and outreach activities with people along the way.

Cammini responds to the urgent need for innovative, integrated approaches in ecological research and communication, exasperated by quick environmental and societal changes. Cammini LTER blends traditional communication —press, social media, blog posts—with experimental, participatory practices like citizen science, which invite citizens to envision the future of the diverse ecosystems. These efforts foster trust between citizens and researchers, building a shared form of knowledge aligned with the "post-normal science" approach that values emotional, relational, and inclusive perspectives.

As Cammini LTER approaches its 10th anniversary in 2025, a special trail will follow the Po River from the Alps to the Adriatic Sea.

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This journey will not only cross diverse ecological landscapes but will also serve as a metaphor of the connections between ecology, society and culture. Inspired by the concept of the "Koinocene," it embraces a shift from the Anthropocene human dominance to a more harmonious, participatory relationship with all life forms on Earth.

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Posters

Investigating the chemobiodiversity of bryophytes through untargeted metabolomics

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Among the large and diversified plant species that populate our planet, bryophytes certainly occupy an important place in the plant kingdom. This group of ancient non-vascular plants evolved more than 350 million years ago from green algae, and comprise more than 20.000 species, considering Mosses, Hornworts and Liverworts. Bryophytes have adapted to live in different environments by developing several adaptations and strategies during their evolution, including the biosynthesis of specialized metabolites. However, information about the metabolome composition of most Bryophyte species remains limited. This work focuses on the characterization of the metabolic profiles of a range of Bryophyte species, including mosses and liverworts. It is part of a larger project, the National Biodiversity Future Center, which aims to explore the chemo-biodiversity of species belonging to Italian flora to discover metabolites exerting possible biological activities towards human health and plant growth promotion and protection. Regarding mosses, the dried plants were initially hydrated and sampled after 7 days. The vegetative material was cleaned from soil particles and dead parts, and subsequently sampled forming 3 different representative biological replicates. For liverworts, plants were immediately cleaned and sampled. Plants were frozen with liquid nitrogen, homogenized to a fine powder and extract with methanol. To elucidate the metabolic profile of the collected species, the methanol extracts were diluted and analysed by following an untargeted metabolomics approach with a UPLC-HRMS technique. Samples were also analyzed in FAST-DDA mode (data-dependent analysis) to assist the subsequent identification analysis, which is actually ongoing.

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