EcoFlor

León 2025

XXII Meeting of the Floral Ecology working group (Ecoflor)
León, Spain
6th - 7th February

#ECOFLOR2025
https://ecoflor2025.es/

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XXII ECOFLOR COMMITTEES

ORGANIZING AND SCIENTIFIC COMMITTEE

Victoria Ferrero
Carmen Acedo
Saúl Manzano
José Ignacio Alonso Felpete

COLLABORATORS

Juan Ivars Aceña
Laura Heras Cuevas

INTRODUCTION

We are pleased to announce the celebration of the 22nd edition of the Annual Meeting of the Floral Ecology working group - EcoFlor, which will take place on 6th – 7th February 2025 in León.

EcoFlor is a working group from the Spanish Association of Terrestrial Ecology and organizes an annual meeting to talk about science. In 2025, the meeting will be held at the Faculty of Biological and Environmental Sciences, University of León.

EcoFlor annual meeting brings together scientists interested in floral ecology and evolution, with the aim of promoting discussion, networking and creativity in science and involving students from all career stages in the process in an open and friendly environment. The participants are invited to present their ongoing projects' results and engage in critical scientific discussion and networking.

Following the traditional format, the meeting will consist of two days of presentations, with plenary talks and oral and poster contributions that will be structured thematically according to the abstracts received. In addition, there will be a visit to the Fabero Paleobotanical Classroom & the Carboniferous Forest at the National Museum of Energy, Ponferrada.

Contributions should be in English to promote discussion and interaction, although Spanish will also be allowed.

PROGRAMME XXII ECOFLOR MEETING

VENUE - Facultad de Ciencias Biológicas y Ambientales (FCCBA). Callejón Campus Vegazana, s/n, 24007 León.

WEB: https://ecoflor20250.webnode.es/

February 5th

15:00-18:00. Workshop (2nd floor, Computer Room, door #316).

Model-based multivariate approaches for pollination biologists using HMSC.

Øystein H. Opedal, Felipe Torres-Vanegas, Yedra García García (Lund University).

February 6th

8:30. Registration.

9:00-10:30. Session 1.

10:30-11:30. Plenary session.

11:30-12:00. Coffee break.

12:00-14:00. Session 2.

14:00-16:00. Lunch.

16:00-18:00. Session 3.

18:00. Poster session.

February 7th

9:00-10:30. Session 4.

10:30-11:30. Plenary session.

11:30-12:00. Coffee break.

12:00-14:00. Session 5.

14:00-16:00. Lunch.

16:00-17:30. Session 6.

Saturday 8th

Departure will be at 9:00 am and arrival at 6-7pm.

Visit to the Fabero Paleobotanical Classroom & the Carboniferous Forest at the National Museum of Energy, Ponferrada

The Fabero Paleobotanical Classroom was born to care for and publicize the paleontological and natural heritage of the Gran Corta, a place where 300 million years ago grew one of the most lush and extensive forests of the Stephanian Carboniferous and that, at the end of the 20th century, it became one of the largest open-pit anthracite mines in Europe, currently in the process of environmental restoration.

The Carboniferous Forest is one of the main attractions of *La Térmica Cultural*. *La Térmica Cultural*

is a space created and managed by the Energy City Foundation (CIUDEN) through the *Just Transition Institute* (ITJ). It is in the old facilities of the Compostilla I thermal power plant, a place that, 50 years after ceasing its industrial activity, is now reborn as a multipurpose center dedicated to the arts, knowledge and professional training.

The tree ferns that populate this space allow the visitor to get a rough idea of the landscape of Bierzo and Laciana 60 million years ago, at the time when coal was formed.

LIST OF ORAL AND POSTER COMMUNICATIONS ORDERED BY SESSIONS

PLENARY TALKS

ORAL COMMUNICATIONS

POSTERS

INVITED SPEAKERS TO PLENARY SESSIONS

Ainhoa Magrach

Ainhoa Magrach is an Ikerbasque Research Professor at the Basque Centre for Climate Change (BC3) and serves as the president of AEET (Asociación Española de Ecología Terrestre). She is a dedicated community ecologist who earned her bachelor's degree in biology from both the Universidad del País Vasco and the Universidad de Santiago de Compostela, followed by a doctorate from the Universidad de Santiago de Compostela. Her academic journey includes a Basque Government Post-doctoral fellowship at James Cook University in Australia, an ETH Foundation/Marie Curie Co-funded fellowship, a Juan de la Cierva at the Estación Biológica de Doñana-CSIC and a Ramón y Cajal and Ikerbasque Research Fellow at BC3.

Ainhoa's research focuses on understanding the impacts of various drivers of global change on biodiversity, ecosystem functioning, and ecosystem services. She has extensively studied the effects of anthropogenic processes, such as selective logging, forest fragmentation, climate change, and agricultural shifts (e.g., to coffee or oil palm), on species interactions—particularly between plants and animals, as well as among plant species.

With over 40 publications to her name, Ainhoa has successfully led projects funded by a range of national and international funding bodies, including the Leonardo fellowship from the BBVA Foundation, several Plan Nacional projects and the ERC Consolidator Grant. Through various initiatives, Ainhoa also actively works to raise awareness about the critical role of pollinators and the impacts of global change on ecosystems.

Mohamed Abdelaziz

Mohamed Abdelaziz is an Associate Professor at the Department of Genetics at the University of Granada. He holds a PhD in Biology from the University of Granada, where he studied the interaction between ecology and genetics in hybrid zones between high-altitude plant species. He was a postdoctoral researcher at the University of Stirling (Scotland), where he began a research line focused on the study of the mechanisms and consequences of speciation in plants. This line, together with his ongoing work on high-altitude hybrid zones, has led to various research projects funded by the Spanish State Research Agency, the Autonomous Organization of National Parks, and international institutions such as the University of Stirling.

Currently, his research is part of the Biological Conservation and Evolution in the Genomic Era group (biochangenet.org), which tackles a wide range of issues in ecology, conservation, genetic improvement, health, and more, using genomic tools and an evolutionary perspective. To date, Mohamed has published several dozen scientific articles and has contributed to many more publications at leading scientific conferences. Additionally, through his research group, he has participated in organizing several high-profile national and international conferences. He has also been recognized for his science outreach efforts, engaging diverse social groups through activities ranging from talks at primary and secondary schools to participation in outreach programs and workshops.

PLENARY TALKS

Plenary Talk (February 6th 10:30-11:30)

The multiscale role of biodiversity in ecosystem functioning and stability

Ainhoa Magrach*
* Basque Centre for Climate Change (BC3)

The role of biodiversity in shaping ecosystem functioning and stability is a fundamental question in ecology. While patterns of correlation between these variables have been extensively studied, the mechanisms shaping them have yet to be fully understood. Furthermore, most research has been conducted within single-trophic communities and at relatively small spatial scales, raising the question of whether the observed relationships are scalable and applicable to multi-trophic communities and broader spatial extents.

In this talk, I will address several of these shortcomings by presenting research conducted across global, landscape, and local scales on plant and pollinator communities, which consistently showcase positive biodiversity-functioning relationships. I will explore the mechanisms underpinning these positive relationships, emphasizing the role of asynchronous dynamics among species and the influence of varying community structures. This multiscale approach not only highlights the robustness of biodiversity's contributions to ecosystem processes but also sheds light on how these dynamics change across spatial and organizational scales. With a particular focus on plant and pollinator communities, I will then also delve into emerging research on microbial communities present in flowers and the guts of pollinators. These microbial assemblages, which include bacteria and fungi, play a critical role in mediating nutrient cycling, plant-pollinator interactions, and overall ecosystem health. I will discuss how pollinator gut microbiomes might be influenced by plant diversity and composition.

By integrating these microbial dimensions, this research aims to provide a more comprehensive understanding of how biodiversity operates across multiple biological layers to shape ecosystem functioning and stability.

Contact: Ainhoa Magrach; **ainhoa.magrach@bc3research.org**

Plenary Talk (February 7th 10:30-11:30)

Is selfing an evolutionary dead end?

Mohamed Abdelaziz*
* Departamento de Genética. Universidad de Granada

Since Darwin, changes in reproductive systems in flowering plants have been recognized as one of the most common evolutionary transitions in nature. However, the absence of examples of evolutionary transitions from autogamy to allogamy in nature, alongside the theoretical framework developed, has led us to consider this latter transition as an evolutionarily dead-end. But what if we discovered that such a transition is possible?

Recently, we have been able to describe solid evidence within the *Erysimum incanum* species complex that points to the existence of evolutionary transitions toward allogamy in an autogamous clade, giving us the opportunity to explore for the first time the mechanisms, processes, and consequences of these types of evolutionary transitions, which have so far been unknown to science.

In this work, we explore the main evidence indicating that the evolution of an allogamous reproductive system is possible from an autogamous system; the genetic mechanisms underlying this transition; the main ecological and genetic processes that stabilize the new morphotypes and the reproductive strategies associated with them; as well as the consequences that this type of evolution and change in reproductive system has on population structure. Of particular interest is understanding how a plant can go from having no pollinator visits to having a generalist guild of pollinator visitors. Thus, these rare transitions can even significantly modify the community in which these plants develop. This work allows us to broaden the perspectives and dimensions with which we have been studying evolution associated with evolutionary transitions in plants so far.

Contact: Mohamed Abdelaziz; **mabdelazizm@go.ugr.es**

ORAL COMMUNICATIONS

Session 1

O1.

Genomic structure and diversity of *Quercus suber* across its complete latitudinal distribution

M. Viveiros-Moniz*, A. Sánchez-Miranda, A. Jesús Muñoz-Pajares, M. Abdelaziz, L. Matias

*University of Granada

Drought conditions driven by climate change threaten plant species worldwide, prompting scientists to investigate local adaptations through intraspecific functional trait differences that could enhance conservation strategies by increasing plant resilience to decreasing water availability. Cork oak (*Quercus suber* L.) is an economically and ecologically valuable woody species that is endemic to the Mediterranean region. For the last 80 years, the entire surface area of cork oak woodlands has been reduced from 140,000 ha to 70,000 ha. Recent research has focused on the impacts of climate change on the distribution and viability of *Q. suber* populations, revealing latitudinal variations in responses to environmental stressors like drought. These variations may be due to adaptations to specific local conditions, suggesting that some populations have developed genetic variants that confer drought resistance.

Hence, this study aimed to characterize the genetic diversity of natural populations of cork oak and to compare genomic patterns across populations in a latitudinal transect covering the complete latitudinal distribution of the species. We have resequenced genomic DNA from over 100 individuals to evaluate the genetic structure of the entire transect as well as the genetic diversity of every population. Our sequencing strategy also allowed us to explore the genetic mechanisms involved in the different tolerance do drought conditions of the studied natural populations. Our results indicate that the populations are genetically distinct, underscoring the critical role of local adaptations in shaping their resilience to environmental stressors.

Contact: Melissa Viveiros Moniz; **melissamoniz@outlook.com**

Session 1

O2.

Depicting the ecological, genetic and reproductive diversification of the Mediterranean *Sonchus asper* complex

Pedro Costales*, Marcial Escudero, Arnald Marcer, Xavier Picó, José Antonio Mejías

*Department of Plant Biology and Ecology, Faculty of Biology, University of Seville, Seville, Spain

The Mediterranean Basin is a renowned world center of differentiation and diversification due to a combination of geological processes and climatic oscillations over millennia. As a result, several organisms exhibit high levels of intraspecific genetic and phenotypic diversity that pose challenges to taxonomists and evolutionary biologists. For example, in its current circumscription, *Sonchus asper* (L.) Hill (Asteraceae) represents a taxonomic complex segregated into two major groups based on differences in flower size and sexual system. The first group has small ligules and short anthers with an autogamous sexual system, and is represented exclusively by *S. asper* (L.) Hill. In contrast, the other group has large ligules and long anthers with a xenogamous sexual system. In this case, these morphotypes correspond to three taxa described during the XIXth century, such as *S. nymanii*, *S. glaucescens* and *S. graecus*, but currently described as a single subspecies of *S. asper*. Furthermore, these taxa present clear differences in their geographical distribution, perpetuation mechanisms and life-history strategies. Our goal is to disentangle the taxonomic relationships among all these taxa from an integrative perspective, by jointly using species distribution models, genetic structure analysis, and reproductive biology experiments. In this communication, we will present the main results of this ongoing study and propose hypothesis on the main processes and mechanisms accounting for the ecological and genetic differentiation of this Mediterranean species complex.

Contact: Pedro Costales Maestre; **pedcosmae@gmail.com**

Session 1

O3.

Bidirectional hybridization is driven by pollinator-relevant floral traits in the phenotypically diverse Alpine orchid genus *Gymnadenia*

Mikhaela Neequaye*, Roman Kellenberger, Rebecca Collier, Pirita Paajanen, Rea Antoniou-Kourounioti, Katherine Wenzell, Lionel Hill, Philipp M. Schlüter, Kelsey Byers

*John Innes Centre, Norwich Research Park, Norwich NR4 7UH United Kingdom

Hybridization provides a "natural laboratory" enabling us to understand how traits are integrated in parent species by observing the phenotypes of hybrid offspring. Orchids in the genus *Gymnadenia* hybridize in zones of sympatry between *G. conopsea* and *G. (Nigritella) rhellicani* in the European Alps. Hybrids are rare and phenotypically distinct from either parent species, and this rarity appears to be due to multiple reproductive barriers between parent species including pollinator and phenological isolation between parent species and decreased seed fertility in hybrids. Genomic evidence based on k-mer analysis of parents and hybrids suggests that hybrids are largely F1s, despite their ability to produce fertile seed. I will present data on a variety of floral traits including gross and fine morphology, color, and scent from both parent and hybrid individuals from two replicate populations and discuss the interpretation of these data for trait integration in the parent species and potential implications for genetic control of these traits. Although parent species present highly internally consistent phenotypes (i.e. are instantly recognizable by their phenotypes), floral traits are only somewhat modular across trait types, and this modularity differs between parent species and is weak in the hybrids as well. This suggests the absence of high-level regulation of the finer details of the floral phenotype, and instead suggests that floral phenotyes are regulated largely at the trait level.

Contact: Kelsey Byers; **Kelsey.Byers@jic.ac.uk**

Session 1

O4.

Self-incompatibility alleles in *Erysimum incanum* and *Erysimum wilczekianum*: discoveries and hints about their evolution and phylogenetic relationships

Carlos Olmedo-Castellanos*, Xavier Vekemans, Vincent Castric, Mathieu Genete, Melissa Viveiros Moniz, A. Jesús Muñoz-Pajares, Mohamed Abdelaziz

* Departamento de Genética, Facultad de Ciencias UGR, Avda. Fuente Nueva s/n, 18071 Granada (España)

Mating systems in angiosperms show a wide diversity, from self-fertilization to crossed fertilization. Some families have a molecular self-incompatibility system which avoids self-fertilization and keep genetic diversity levels. In Brassicaceae, a key-lock protein system between pollen and stigma is the classical model, with two main genes: SRK for the stigma receptor and SCR for the pollen protein, set in the same genomic region, called S-locus. When there is a recognition between proteins of the same haplotype, self-fertilization is blocked. This region has a high negative frequency-dependent selective pressure, being one of the most diverse regions in angiosperm genomes.

Erysimum is a genus where this system is still unknown. We analyzed whole genome sequences from two species: *E. incanum* (from the Iberian Peninsula and Morocco, showing selfing mate and diploid, tetraploid and hexaploid populations) and *E. wilczekianum* (from Morocco, showing outcrossing mate and tetraploid populations) with specifically designed bioinformatics pipelines to identify S-locus alleles. Preliminary results are congruent with the known mating systems, with *E. wilczekianum* showing the classical S-locus model. S-locus alleles phylogeny points also a possible hint for polyploid populations origins in *E. incanum*.

Contact: Carlos Olmedo Castellanos; **e.carlosolmedo13@go.ugr.es**

Session 1

O5.

Variation in flowering onset of *Linum bienne*: plastic and adaptive responses to altitudinal gradients

Macarena Marín-Rodulfo*, José R. Grande Allende, Isabel Martín-Girela, Eduardo de la Peña, Rocío Pérez-Barrales

*Universidad de Granada

In seasonal environments, the genetic control of flowering onset is under the regulation of local climatic conditions. This allows plants to synchronise plant growth and reproduction with the optimal local growing conditions to maximize fitness. However, over the last 30 years, the scientific community has evidenced shifts in flowering phenology in the context of climate change. What remains unclear is whether the shift in flowering onset represent a plastic response to changing local climatic conditions, or an adaptive response to climate change. The present study investigates flowering onset variation in *Linum bienne*, an herb growing across Mediterranean and Atlantic regions up to 1200 m in elevation. Across its range, flowering onset varies with latitude, with southern populations flowering earlier than northern ones, partially reflecting climate gradients. Here, we sampled populations along an elevational gradient (15 populations between 50 and 1200 m) and exposed them to 3 contrasting altitudes (86, 738, 1980 m a.s.l.) to measure survival, plant size, number of days to flowering, floral traits, seed and fruit production. The results showed delayed flowering onset at higher elevations, where plants were also smaller, potentially impacting fitness. Together, these findings underscore the adaptive value of the flowering onset and life history traits to allow a shift in the species distribution along altitudinal gradients, and how they adapt to new environments.

Contact: Macarena Marín-Rodulfo; **macamarin@correo.ugr.es**

Session 1

O6.

Phenotypic and transcriptomic plasticity in reproductive traits under selection

Xavier Picó*

* Estación Biológica de Doñana (EBD-CSIC). Av. Américo Vespucio 26, 41092 Sevilla (ESP)

Identifying traits underlying local adaptation and their genetic basis has long attracted the attention of evolutionary biologists. In contrast, phenotypic plasticity in both attributes, particularly in functional genetic aspects, has remained a little bit in the background.

In this communication, I will present past, recent, and ongoing results on the extent of phenotypic and transcriptomic plasticity in a major reproductive trait with adaptive value in annual and short-lived perennial plants, such as flowering time. The results stress the enormous evolutionary value of phenotypic and transcriptomic plasticity to understand long-term population dynamics and eventually evolutionary change.

Contact: Xavier Picó; **xpico@ebd.csic.es**

Session 2

O7.

Flight in the dark: hawkmoth-plant interaction from a hyperdiverse grassland conservation area from Brazil

Gizele Cristina de Almeida Silva*; Luis Gustavo Sousa Perugini; Lorena Bueno Valadão Mendes; André Rodrigo Rech.

*UFVJM - Minas Gerais, Brazil

Among nocturnal pollinators, hawkmoths play a fundamental role in pollinating many plant species. Although the Cerrado is a highly diverse environment, knowledge about the hawkmoth fauna interacting with native plants remains limited. Additionally, threats such as habitat fragmentation, climate change, and invasion by exotic species compromise the diversity and ecosystem services these pollinators provide. This study aimed to describe the diversity of species of Sphingidae and their interaction with plants in the Parque Estadual do Rio Preto (PERP). Nocturnal collections were conducted using light traps at two points of different altitudes within PERP during the dry and rainy seasons. From May 2023 to March 2024, eight collections were carried out, each lasting 12 hours, capturing 353 individuals from 38 species belonging to 14 genera. The most abundant species were *Erinnyis ello* (115 individuals) and *Pseudosphinx tetrio* (34 individuals), representing approximately 42% of captures in both locations. The collections recorded 102 individuals of 24 species in the dry season and 251 individuals of 33 species in the rainy season, with 19 species present in both seasons. The results do not indicate any significant difference in richness, abundance, or species composition between seasons. Initial results suggest a modular network, with a low nestedness and specialization. The plant-hawkmoth interactive community from the Rio Preto region seems to be stable over time and modular. The very low specialization suggests that hawkmoths from the area of Rio Preto are short probosci's opportunist foragers.

Contact: Gizele Almeida; **gizelealmeida.15@hotmail.com**

Session 2

O8.

Nutrient enrichment negatively impacts flowers and pollinators, especially in warmer climates

J. P. Cancela*, H. Olde Venterink, T. Dias, P. A. V. Borges, D. P. Vázquez, L. Abts, E.S. Bakker, M. N. Bugalho, M. C. Caldeira, A. Eskelinen, L. A. Garibaldi, A. Jentsch, N. Johanson, M. Kuhlman, L. S. Lannes, H. Martinson, N. Pérez-Méndez, P. Peri, G. F. Veen, A. C. Risch, M. A. Schuchardt, M. Schuetz, R. Nelson, R. Virtanen, E. Seabloom, E. T. Borer & L. G. Carvalheiro

*CE3C-University of Azores

Human activities are changing global biogeochemical flows of Nitrogen and Phosphorous. Nutrient enrichment negatively affects plant communities, but little is known about its consequences for pollinators. Using 14 long-term fertilization experiments across three continents, we show that the effects of nutrient input (especially N) on floral resources and pollinators depend on local climate and soil conditions. In regions with naturally nutrient-richer soils (e.g. temperate European grasslands), N input decreased floral resource availability, this effect being stronger in warmer climates, where pollinator activity also declined. In regions with nutrient-poor soils (e.g. Brazilian Cerrado, Mediterranean grasslands), negative effects of N on floral resources and pollinators were also detected in warmer climates, but positive effects were detected in colder regions. Effects of P and K inputs were greater on pollinators than on plants. These results highlight the higher susceptibility of plant-pollinator relationships to eutrophication in warmer regions.

Contact: Juan Pablo Cancela; **jpcancela@fc.ul.pt**

Session 2

O9.

Plant-pollinator interactions in spontaneous and sown cover crops in a Mediterranean agroecosystem.

Casiraghi, A.*[1]; Pérez Hidalgo, N.[1]; Monzó, C.[1]; Hernández-Castellano, C.[2,3]

*[1] Instituto Valenciano de Investigaciones Agrarias (IVIA), Centro de Protección Vegetal y Biotecnología, Unidad de Entomología, CV-315 km 10.7, 46113, Valencia; [2]. Wildlife Ecology and Health Group, Facultat de Veterinària, Universitat Autònoma de Barcel

Cover crops are green infrastructures of increasing interest in the European Union, because they can mitigate climate change, improve soil quality and promote agroecosystem biodiversity and ecosystem services.

However, the design of cover crops (which species should be sown to foster biodiversity) is usually ignored, posing at risk their effectiveness. In the case they aim to enhance pollination, it is essential that sown flowering species attract pollinators abundantly, diversely, and constantly. For this reason, understanding plant-pollinator interactions in cover crops is essential.

In this study we conducted a one-year survey in flowering cover crops of two mandarin orchards (Pego, Spain). Flowering phenology was noted and plant-pollinator interactions were recorded monthly in a replicated experimental design. We used a plant-pollinator network approach to evaluate species centrality of plants. We built GLMM to associate plant centrality to distinct ecological features of plants, such as origin (spontaneous vs sown) and taxonomic family.

Our results show that keystone plants for pollinators in cover crops are mostly spontaneous species of a limited range of taxonomic families. For instance, *Euphorbia segetalis* was an essential source for pollinators during spring and attracted short-tongued small bees, flies, ants, hoverflies, wasps and parasitoids, therefore potentially enhancing both pollination and biological control services. In contrast, among sown plants, *Onobrychis viciifolia* was virtually the only effective one, who was visited by long-tongued large bees, bumblebees and honeybees.

This work strengthens the necessity of understanding plant-pollinator interactions in cover crops to wisely design agroenvironmental measures in agroecosystems and assure their effectiveness.

Contact: Alice Casiraghi; **casiraghi_alia@gva.es**

Session 2

O10.

Invasion in the rocks: how *Buddleja davidii* disrupts plant and pollinator communities in quarry ecosystems

Clément Tourbez*[1], Florian Cosa[1], Denis Michez[1]

*[1] Laboratory of Zoology, Research Institute for Biosciences, University of Mons, 7000 Mons, Belgium.

Invasive plant species thrive in highly disturbed environments, such as quarries, which serve as biodiversity hotspots. One major invader in these habitats, the butterfly bush (*Buddleja davidii*), competes with native flora, potentially impacting plant and pollinator communities and disrupting plant-pollinator networks. This study investigates the impact of *B. davidii* invasion on (i) plant species richness and floral resource availability, (ii) the abundance and species richness of wild bees, syrphid flies, and butterflies, and (iii) plant-pollinator networks. Monthly plant surveys, floral unit counts, and pollinator samplings were conducted from May to September 2024 across 27 sites in nine Belgian quarries, spanning a *B. davidii* invasion gradient. We recorded 169 plant species, over 150,000 floral units, and 88 bee, 44 syrphid, and 25 butterfly species, totaling 3,993 pollinator individuals. Increasing *B. davidii* invasion had no effect on plant species richness but reduced native floral unit availability. Butterfly abundance and richness increased, while syrphid abundance decreased, with increasing plant species richness and *B. davidii* invasion. Nine common pollinator species showed reduced abundance with *B. davidii* invasion, whereas only two butterfly species exhibited increased abundance. While *B. davidii* invasion did not impact interaction richness or the robustness of plant-pollinator networks, plant species richness positively influenced network robustness. These results underscore the impact of *B. davidii* invasion on native quarry flora and its cascading effects on wild pollinators and plant-pollinator networks. In the current context of globalisation, understanding how species invasions compromise mutualistic interactions and habitat resilience is increasingly essential.

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Session 2

O11.

The role of temporal niche of floral resources in plant-pollinator interactions

Silvia Del Vecchio*, Laura Zavatta, Serena Magagnoli, Marta Galloni, Daniele Sommaggio, Giovanni Burgio

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Climate change has been demonstrated to have effects on ecological communities, causing perturbation in habitat balances and consequent loss of biodiversity. This research aims to analyze plant-pollination network in a fir forest in the Northern Appennines (Italy), an unusual habitat thanks to its localization in mediterranean area but characterized by a typical north European climate condition.

Samplings were carried out monthly, from May to September, along transects of 250 m length each to (i) evaluate pollinators (hoverflies and bees) abundance; (ii) compile a checklist of flowering species; (iii) quantitatively assess the floral resources, by counting the visual displays of each flowering species, in 5 plots (1m x 1m) per transect. Through diversity indices we explored pollinators and plant species turnover during the observed season.

Plant species showed a marked turnover during the flowering season. Highest pollinator interaction frequencies were observed on *Eupatorium cannabinum* and *Sambucus ebulus*. The species with the longest flowering period (e.g. *Silene dioica*, *Geranium robertianum*, *Geranium nodosum*) were those found both within the forest and at its edge. *Geranium nodosum* received also a high number of visits.

Our research provides insights into the seasonality of plant-pollinator interactions and contributes to understanding pollinator diversity in relation to the availability of plant resources.

Contact: Silvia Del Vecchio; **silvia.delvecchio@unibo.it**

Session 2

O12.

The importance of nocturnal pollination for the Galapagos Islands

Marta Quitián*, Anna Traveset, Ruben Heleno

*Instituto Mediterráneo de Estudios Avanzados (IMEDEA, CSIC-UIB)

Around 90% of the world's flowering plant species rely on animal pollination, a crucial ecological process carried out by a diverse range of species, including insects, birds, and mammals. However, much of the existing research on pollination focuses primarily on diurnal insects, particularly bees and bumblebees. The role of nocturnal pollinators, in contrast, has been largely overlooked. Notably, approximately 30% of vertebrates and more than 60% of invertebrates are nocturnal. Yet, just 5% of studies on pollination ecosystem services specifically address nocturnal pollinators. In this context, we present preliminary data on the significance of nocturnal pollinators within the complete pollination networks of the Galápagos Islands—an ecologically unique and historically important archipelago. Our findings offer valuable insights into the broader ecological concepts surrounding pollination.

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Session 2

O13.

Next Generation Sequencing for the identification of pollen transported by insect pollinators

Serena Magagnoli*, Laura Zavatta, Cristina Movalli, Daniele Sommaggio, Claudio Ratti, Riccardo Baroncelli, Salvatore Iacono, Giovanni Burgio

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Plant-pollinator networks are typically based on visual assessment of pollinators on plants. However, in recent years, molecular approaches have been highlighted as a potential alternative method for constructing pollen-carriage.

This study was conducted in Val Grande National Park, the largest wilderness area in the Italian Alps. Insect pollinators were collected from flowers along four transects surveyed monthly. Pollen samples, obtained by washing the insects, were then subjected to DNA extraction, amplification, and sequencing. Representative sequences of each amplicon sequence variant (ASV) were assigned taxonomically using a reference database.

We analyzed 61 specimens belonging to twelve different families of insect pollinators across three orders: Hymenoptera, Diptera and Coleoptera. In total, we detected 45 plant families and 59 genera.

Pollen obtained by the analyzed taxa was quite heterogeneous and variable among individuals, although some botanical families (i.e., Fabaceae, Solanaceae) and genus (i.e., *Rhodendron*, *Calluna*, *Ranunculus*) were well represented across samples. Interestingly, we found pollen of anemophilous plants (i.e, Poaceae) on *Syrphus* sp., *Apis mellifera*, *Lasioglossum* sp., *Halictus* sp. and *Oedemera* sp.

These preliminary findings highlight the potential of this method for detecting plants which are otherwise difficult to assess visually. Additionally, it offers valuable insights into the interactions between pollinators and plants within a protected area.

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Session 2

O14.

Pollen transfer efficiency as a function of pollen deposition and removal

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Backround: Sexual reproduction of the majority flowering plants depends on pollinators, and plants strive to maximize their fitness by increasing successful pollen deposition and minimizing pollen loss. However, most of the produced pollen grains end up being lost via consumption, heterospecific deposition and falling on the ground. Moreover, different pollinator taxa differ significantly in the ratio of pollen which they remove from anthers and deposit on stigma i.e. pollen transfer efficiency. Pollinator's efficiency shows how many pollen grains did the pollinator lose but it doesn't tell us how or where the pollen grains were lost. For this reason, our goals are not only to determine the pollen transfer efficiency among pollinator taxa visiting *Succisa pratensis*, but also to trace down the pollen pathway to paternity from production to deposition, including the determination of loss processes during the pollen transport.

Methods: We collected data about visitation frequency and the amount of pollen removed and deposited during a single visit of a pollinator. To conclude how much pollen they lose we collect data about pollen production, pollen in the pollinator's gut and on his body. For context and stronger results we also collect the total depositions on stigma and visitation network for all plants interacting with *Succisa pratensis* through pollinators.

Results: Results are not clear, because not all samples are analyzed yet, but they will be at the time of the conference.

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Session 3

O15.

Putting to rest the importance of petal asymmetry in fireweed

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Fluctuating asymmetry in bilaterally symmetric body plans has been thought to be a measure of phenotypic quality of individuals as those in good condition will be able to develop more symmetrically. In animal-pollinated plants, in flowers with bilateral floral symmetry, symmetry in the petals has also been proposed as a measure of quality. For fireweed (*Chamerion angustifolium*), previous work suggests flowers that are more symmetrical have more nectar and bees prefer visiting symmetrical over asymmetrical flowers. We asked whether floral symmetry is an honest signal of reward and whether stress induces increased asymmetry in flowers. We found no evidence for honest signalling of symmetry for nectar quantity or quality and drought stress did not change the asymmetry of flowers. While the pollinator attractiveness of symmetry may seem an appealing idea, we suggest it should be laid to rest.

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Session 3

O16.

Floral biology of *Silene migjornensis*, a threatened species to the southern dunes of Mallorca (Balearic Islands)

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Silene migjornensis is a threatened annual species located in the southern dunes of Mallorca, from Arenal de Sa Ràpita to Platja d'Es Trenc. Previously named *Silene sericea* var. *balearica*, it has been recently recognized at species level. Its floral biology is unknown, but essential for conservation efforts. In this work, the stages of floral development, flowering synchrony at both intra-individual and population level, pollen germination and stigmatic receptivity have been studied from an ex situ population. Pollen viability was measured through pollen germination using the Brewbaker and Kwack medium with 20% sucrose, and the stigma receptivity was determined using a Peroxtesmo esterase indicator. Number of male and female flowers were recorded 1-2 times per week in 25 individuals along the complete flowering period (17 observation days), and flowering synchrony indexes were calculated. Results showed that flowers present complete protandry, with overlap between male and female phases among flowers within individuals, allowing geitonogamy events. However, high population-level flowering synchrony enables cross-pollination. Pollen germination is generally low (9.18% 1.48, n=8) and exhibits a very short viability period, which is at night (from 4:00 p.m. to 4:00 a.m. solar time). Furthermore, the two whorls of stamens mature sequentially in two consecutive days. The receptivity of stigmas lasts around 7 to 9 days, enhancing opportunities of pollen deposition. This work is a basis of knowledge about the floral biology of the species, which must be complemented with experimental work to study the mating system and pollinator dependence.

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Session 3

O17.

Two congeneric *Utricularia* species with distinct reproductive strategies

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Under the current global changes and dramatic biodiversity loss, conservation takes on a crucial role for protecting nature. However, conservation set grounds on knowledge about species biology and ecology. The genus *Utricularia* L. consists of a group of carnivorous plants with several threatened species, whose flowers are seldom observed, leading to a poor knowledge about sexual reproduction, a key component of the plants' life cycle. In Portugal, two free-floating, native and vulnerable species from this genus, *Utricularia* gibba L. and *Utricularia* x *neglecta* Lemn., coexist in mostly isolated, acidic and oligotrophic ponds. They differ greatly in size, with *U*. x *neglecta* producing significantly larger flowers than *U*. *gibba*. This study aimed to characterize the flower biology and reproductive strategies of both species and assess their implications for population dynamics. We examined floral morphology and physiology, reproductive system and the influence of animal visitors and pollen origin on the reproductive fitness, comparing the results between species. Despite sharing the same habitat, the two species exhibit distinct reproductive strategies, pollination traits and natural sexual fitness. Surprisingly, *U.* x *neglecta*, which invests heavily in floral attractiveness, was found to be sterile, while *U. gibba*, with less resource investment, remains fertile. These findings provide important insights for the understanding and conservation of these threatened species.

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Session 3

O18.

Habitat disturbance affects floral traits of a tropical herb

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Tropical rainforests transformation affects native plant populations and communities. These changes impact various levels of biological organization and ecological processes. We investigated how forests transformation alters the morphology and floral integration of a native herb, *Heliconia collinsiana*, in Southern Mexico. In continuous primary forest and secondary forest the following characteristics of *H. collinsiana* inflorescences were compared: number and size of bracts, number of flowers, weight, length and width of floral structures, and hercogamy. The quantity and quality of nectar and the length of the stems with inflorescences, as well as the inflorescence length, were determined. Overall, significant differences were found between forest types in the floral and vegetative traits considered, with significantly higher values for primary forests. The seven floral traits examined were significantly integrated in both forest types and showed greater phenotypic integration in primary forests than in secondary ones. In contrast, the volume and quality of nectar produced in *H. collinsiana* flowers were significantly higher in secondary forests. The results indicate that forest transformation impacts floral traits and phenotypic integration in the flowers of *H. collinsiana*. Changes in the phenotypic morphology of flowers may affect cross-fertilization and reproduction.

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Session 3

O19.

Evaluating the impact of pollinator-friendly measures implemented within the LIFE 4 Pollinators project

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Insect-mediated pollination is a fundamental service for both natural and agricultural ecosystems. However, in recent decades, a decline in pollinator populations has been reported worldwide, which has made urgent the rapid setting up of conservation interventions for their safeguard. Within the LIFE 4 Pollinators project (LIFE18 GIE/IT/000755) we indicated a number of possible interventions to the different stakeholders, such as insect hotels placement, flower strips planting, pesticide use reduction or abandonment, and mowing regulation. Different actions were conducted in different sites, where effects on pollinator diversity and abundance were assessed, following specific protocols, suited to the expertise of people conducting field surveys and to the context. Assessments were conducted in 11 agricultural areas in Emilia Romagna (Italy), six sites located in urban parks in Mallorca (Spain), six Italian semi-natural sites within the so-called Bee Valley area, and one archeological site in Lesvos (Greece). Depending on the protocol applied, sampling consisted of hand-netting, photo recording or pan trapping of floral visitors within transects. In all cases, pollinators were identified at least at the level of broad functional groups (bees, hoverflies, bee flies, wasps, beetle, butterflies and moths). Altogether, more than 80 days of fieldwork were performed, and more than 16,000 pollinators recorded. Our results bring further evidence that the implementation and adoption of pollinator-friendly actions and practices lead to an overall increase in pollinator diversity and abundance, highlighting that the combination of different measures targeting pollinator conservation can be a winning approach in various landscape contexts.

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Session 3

O20.

Indiana Jones and the Temple of Bloom: herbaria as the new archaeological sites for plant phenology

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Herbaria, with their vast collections of preserved plant specimens, serve as invaluable “time capsules” that provide a window into historical plant phenology. Using herbaria collections, botanists can become the new Indiana Jones, just as archaeologists unearth clues from ancient ruins, by carefully annotating the phenological status of plants as they remained when collected and pressed in herbaria sheets. These collections offer a unique opportunity to study the long-term phenological patterns of species, including the impact of climatic shifts on flowering and fruiting dates. In this context, *Linum bienne* Mill. (Linaceae), a species native to the Mediterranean and Atlantic Europe serves as a fascinating case study. The species exhibits latitudinal variation in the timing of flowering, influenced by local climatic conditions. By retrieving data from herbaria collections, this is, phenotyping specimens and quantifying flower and fruit number per pressed sample, this study explores the geographic and temporal shifts in *Linum bienne*’s phenology. The work we will present not only deciphers changes in phenological trends over 200 years, but also lays the groundwork for predicting how *Linum bienne* and similar species may adapt to future environmental changes. In this way, herbaria act as the new “archaeological sites” for studying plant responses to climate change, unlocking valuable insights into the evolution and resilience of plant species in the face of global change.

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Session 4

O21.

Floral longevity spaces: a multidimensional framework for the study of floral longevity

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Floral longevity is an important component of floral display. There is a wide range of interspecific variation in floral longevity, driven by two factors: (1) a cost-benefit balance between pollen removal and deposition, and (2) a host of environmental factors that influence the physiological costs of keeping functional flowers. Traditionally, floral longevity has been estimated as the time from corolla opening to corolla wilt under one of two conditions: (a) natural pollination (natural floral longevity) or (b) pollinator exclusion (maximum or potential floral longevity). Here, a new framework is put forward that considers floral longevity as a multidimensional trait. In this new framework, three estimates of floral longevity are relevant: potential floral longevity, natural floral longevity and minimum floral longevity, assessed by hand-pollinating freshly opened flowers. In addition, three time lapses are considered: floral longevity span (difference between minimum and potential floral longevity), distance to the minimum boundary (difference between natural and natural floral longevity) and distance to the minimum boundary (difference between potential and natural floral longevity). All together, these six estimates allow to build floral longevity spaces. Using a data set of ca. 90 species, I explore the interspecific variation in floral longevity spaces in relation to flower size, dichogamy, self-compatibility, latitude and flowering phenology. In addition, I suggest a protocol for the study of floral longevity spaces along environmental gradients.

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Session 4

O22.

Pollinator-mediated floral divergence in a tropical plant species complex

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Widespread species usually vary phenotypically across their range. This variation often but not always represents local adaptation, formation of ecotypes, and sometimes ecological speciation driven by divergent ecologically mediated natural selection. In animal-pollinated plants, the drivers of such divergent selection are often pollinators but may also include antagonist such as seed predators and herbivores, and recent work suggest that ancestral genetic constraints may also guide patterns of phenotypic divergence. To assess drivers of floral divergence in *Dalechampia scandens*, a species complex of euphorb vines, we have surveyed populations across much of the range, amassing data on pollination ecology and other biotic interactions. Here I use these data to explore pollinator-mediated floral divergence while considering the influence of other biotic interactors and of genetic constraints as quantified by multivariate genetic architecture of floral traits. Major emerging patterns include apparent adaptation to both local pollinator assemblages and pollination reliability, and that these patterns differ within and among member taxa of the *D. scandens* complex. I discuss these findings in light of processes driving local adaptation, formation of pollination ecotypes, and ecological speciation.

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Session 4

O23.

A mosaic of local pollinator assemblages underlies floral trait divergence in a pollination-generalized plant.

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The astonishing diversity of floral traits represent, in part, an adaptation to the behavioural preferences and functional characteristics of the associated pollinators. Further, the composition of the local pollinator assemblage is expected to differ across the distribution range of a particular plant species, with the potential to generate a geographic mosaic of divergent patterns of phenotypic selection that can represent an avenue of adaptation to the local pollinator assemblage. Thus, studies that relate geographical variation in floral traits to the distinct regimes of phenotypic selection exerted by the local pollinator assemblages are fundamental to understand the interplay between microevolution and macroevolution. This is particularly relevant for generalized plant-pollinator interactions, where a particular plant interacts with a broad range of pollinators. Here, we evaluated whether geographical variation in the composition of the local pollinator assemblages can establish distinct regimes of phenotypic selection and underlie the patterns of divergence in floral traits of *Viscaria vulgaris*. We observed a taxonomically and functionally broad range of pollinators and detected geographical variation in the composition of the local pollinator assemblages. Despite generalized plant-pollinator interactions, we detected that the observed variation in floral traits was associated with divergence in the composition of the local pollinator assemblages. We argue that generalized plant-pollinator interactions can exert phenotypic selection on floral traits and that distinct local pollinator assemblages can underlie the patterns of divergence in floral traits. Together, these outcomes indicate that specialized plant-pollinator interactions are not required to generate and maintain the diversity of particular floral traits.

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Session 4

O24.

Can co-flowering species influence each other's evolution?

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Co-flowering species within a community often interact for shared pollinators which can affect their reproductive success on varying ways depending on whether interactions are positive (facilitative) or negative (competitive). Indirect reproductive interactions between co-flowering species may also result in nonadditive effects on patterns of selection on floral traits that cannot be predicted by pairwise species interactions. However, studies addressing natural selection on a species in the presence of other co-flowering species are still rare. Here, we applied recent statistical models within the Hierarchical Modelling of Species Communities (HMSC) framework to estimate phenotypic selection on floral traits simultaneously in three co-flowering species while accounting for potential pollinator-mediated reproductive interactions among them. To this aim, we focused on three co-flowering orchid species in the island of Öland (Sweden) mainly pollinated by bumblebees. We recorded phenotypic traits, flower abundance and reproductive fitness of each orchid species across 77 1m2 patches that varied in species abundance and composition. Our study represents a promising approach to incorporating the complexity of multispecies communities into our understanding of floral evolution. Moreover, this framework can be applied in the analysis of reproductive interactions and natural selection in other organisms co-occurring in complex communities.

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Session 4

O25.

Effects of pollination dynamics on biological efficiency in a population with a strong family structure.

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Plants tend to be distributed in heterogeneous aggregates within their populations. As these aggregates of individuals are frequently composed of relatives, plants tend to live within patches of individuals with high genetic relatedness. This may have important consequences for plant fitness. On one hand, individuals within the same patch can share resources to attract pollinators increasing both direct fitness and indirect fitness through the reproduction of relatives. On the other hand, biparental inbreeding depression may reduce fitness if mating predominantly occurs between relatives. In this study, we used *Moricandia moricandiodes*, a species showing plasticity in its floral displays to the genetic structure of the neighborhood. We quantified the spatial pattern of individuals and genotypes within a natural population, estimating female fitness from the total number of seeds, and male fitness from the reconstruction of pollination events by assigning paternity to 265 seedlings using low-coverage whole-genome sequencing. Our results will assess the role of kin selection on floral displays under natural conditions by quantifying the effect of the genetic structure of the neighborhood on both male and female fitness components.

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Session 4

O26.

Spatial interaction turnover and stable resource partitioning in bumblebee-plant networks.

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Plant-pollinator interactions, critical for biodiversity and ecosystem functioning, often exhibit spatial and temporal variability driven by species turnover and interaction rewiring. However, the relationship between this variability, its key drivers such as environmental filtering and biological factors, and whether it influence resource partitioning among bumblebees remain underexplored. This study investigates the spatial dynamics of plant-bumblebee interaction networks across 30 alpine meadows in the Shangri-La region of the Hengduan Mountains, a global biodiversity hotspot. Our findings reveal that interaction turnover is predominantly driven by plant species turnover. Environmental filtering, including spatial distance, elevation, and landscape composition, emerged as key drivers of interaction patterns. Interaction rewiring was positively influenced by trait matching, phenological overlap, potential competition, elevation differences, and landscape composition. Bumblebee floral preferences were shaped by biological factors such as trait matching, phenological overlap, plant abundance, floral resource availability, and potential competition, with no significant correlation to environmental factors. Despite species composition variability, the networks exhibited consistent modularity across all sites, with dominant species partitioning resources into distinct modules, thereby promoting coexistence. This study bridges the theoretical frameworks of community assembly and species coexistence by illustrating how environmental filtering drives species turnover, while resource partitioning stabilizes interaction networks. These findings enhance our understanding of ecological resilience in pollination networks.

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Session 5

O27.

Contrasting plant-pollinator network structure between a pristine and a disturbed island in the Canarian Archipelago

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The accelerated loss of biodiversity is particularly pronounced on islands, which host approximately 30% of global biodiversity hotspots and account for c. 80% of known extinctions. This highlights the importance of studying islands to understand their complexity and vulnerability to global change. In this work, we compare plant-pollinator interactions on an uninhabited pristine island with those on a nearby inhabited and disturbed island, aiming to explore if their network structure differs in their resilience to potential future disturbances. We performed direct observations of pollinators visits to flowers over two flowering seasons, and compared the diversity, network structure and species roles between the two islands. We found that the disturbed island exhibits greater pollinator diversity and a higher connectance than the pristine island. The latter holds a higher number of specialized species, resulting in a more fragile and less resilient network. Our study contributes with valuable information on how human disturbance impacts island habitats, with potential consequences for community functioning in these already fragile ecosystems.

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Session 5

O28.

Fitness benefits of generalization in a deceptive pollinated species in disturbed habitats

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Plant-pollinator interactions are crucial for ecosystem maintenance in changing landscapes. Recently, network analysis has been applied at an individual-based level to determine how individual traits affect an individual's role in pollination networks and their reproductive success. However, most studies have focused on reward-based pollination, deceptive pollination might exhibit unique patterns.

We selected *Arum pictum*, an autumnal trap inflorescence pollinated by dung flies and beetles. We studied how individual and neighbourhood traits influences an individual's role in networks and reproductive success. We collected pollinators trapped in inflorescences from two disturbed and three natural sites in Mallorca. We constructed individual plant-pollinator interactions and calculated individual generalization metrics like degree, specialization (d') and closeness centrality. We also recorded their individual seed production, biometrical traits (appendix and spathe size, appendix temperature, entrance diameter) and neighbourhood information (nearby inflorescences' state).

Our results revealed that the number of nearby male-phase individuals negatively influenced individual degree and closeness centrality. Conversely, appendix temperature positively increased degree. Appendix length showed contrasting effects on degree depending on disturbance: positive in disturbed and negative in natural sites. Natural sites also exhibited a lower degree and higher specialization compared to disturbed sites. Specialization decreased with higher appendix temperatures in natural sites but increased in disturbed sites. Specialization was negatively related to individual reproductive success, especially in disturbed sites.

In this deceptive system, individual traits and co-flowering context influence network roles and reproductive success. Relationships varied depending on disturbance. Individuals with traits favoured by diverse dung-insect communities were more successful in disturbed localities.

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Session 5

O29.

Pollination networks under pressure: insights from two tropical islands with varying disturbance levels

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Anthropogenic disturbances can significantly reshape ecological interactions, including those involved in the pollination by animals which is an essential function for plant reproduction and the maintenance of terrestrial ecosystems. Pollination interactions are particularly sensitive to human activities on islands, owing to their isolation, high levels of endemism, and the unique adaptations of their ecological communities to low competitive pressures. Thus, in the context of global change, it is vital to study island biodiversity in detail to assess the vulnerability of pollination interactions to historical, ongoing, and future human activities. The Seychelles archipelago, an ancient (~66 Myr) island group with a long-established terrestrial ecological community, provides a unique setting to investigate pollination ecological processes. We applied a network approach to compare pollination interactions across two islands in the Seychelles with different levels of anthropogenic disturbance (little vs. high disturbance). Pollination networks were constructed through direct field observations of floral visitors. We analysed the ecological complexity of pollination in each island using standard metrics of quantitative bipartite networks. Our results showed that pollination networks differed between islands not only in terms of species richness and composition but also in the diversity and the strength of interactions. These findings enhance our understanding of the structure of pollination networks and their responses to anthropogenic pressures, such as species introductions. By uncovering these interaction patterns, we can inform conservation strategies aimed at preserving pollination services and the overall ecological integrity of island ecosystems.

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Session 5

O30.

Impact of rats on pollination networks in the Seychelles

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The introduction of non-native mammalian predators, such as the black rat (*Rattus rattus*), poses a significant threat to native biodiversity worldwide, particularly on islands. These rodents are highly adaptable, with diverse diets and a remarkable ability to colonize new habitats, leading to profound impacts on both native flora and fauna. Islands are especially vulnerable to rat invasions due to their often depauperated communities and lack of natural predators. This study investigates the effects of black rats on pollination networks across nine islands in the Seychelles archipelago, each with differing histories of rat invasion. Islands were classified into three categories: currently invaded by rats, rat-eradicated, and never invaded. We assessed the structure of pollination networks on each island by examining key metrics commonly used in quantitative bipartite networks. Additionally, to better understand the role of rats in these networks, we collected fecal samples from rats on invaded islands to analyze their diets. Our findings aim to elucidate how rats may alter pollination dynamics, particularly by predating on or competing with pollinators, including both vertebrate and invertebrate species. This research provides valuable insights into the ecological consequences of invasive predators on island ecosystems and highlights the importance of rat management in conserving native pollination services.

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Session 5

O31.

The resilience of plant-pollinator networks after different scenarios of large herbivore overabundance

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The resilience of ecological systems, or the capacity to reach pre-perturbation ecological integrity, is mostly understudied in plant-pollinator systems. Here we present results from a 4-year study in a Mediterranean scrubland. We experimentally modified red deer (*Cervus elaphus*) density in adjacent enclosures to simulate current scenarios of large herbivore overabundance (high and hyper densities). We also set a control exclosure from herbivores occurring at natural densities in the study area. Both overabundant scenarios experienced herbivore overabundance (first two years) followed by natural densities (last two years). Throughout the study period we measured red deer browsing in scrub species, and several variables regarding the complexity of plant-pollinator communities, interactions, and networks. The control exclosure showed higher complexity than the overabundance scenarios, and experienced increased complexity throughout the study period. In the overabundance scenarios, browsing degrees increased in time, causing the local extinction of some scrub species and the simplification of plant-pollinator networks. When red deer density decreased, scrub species affected by browsing recovered, setting new stems and flowers, but resilience was limited to plant communities and only evident in the high-density scenario. Our study shows that plant-pollinator network resilience is time-consuming, as we do not detect yet the recovery of interactions and the whole network structure. Resilience also seems to be dependent on perturbation intensity, as seen in the hyper-density scenario, where no recovery was detected. This last situation uncovers the possibility that after extreme-intensity perturbations plant-pollinator networks reach an alternative equilibrium state characterized by a lower degree of ecological complexity.

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Session 5

O32.

The neglected floral visitors in the Galápagos Islands: understanding the structure of ant-flower interaction networks

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Ant-flower interactions are critical for ecosystem functioning, but the role of ants as floral visitors is still understudied, particularly in isolated ecosystems such as the Galapagos Islands.

This study explores the structure of ant-flower interaction networks across five islands in the Galapagos, focusing on the interactions between endemic and non-native ant species and native plants. Using network analysis, we assessed interaction specialization, modularity, and nestedness.

Results reveal that the oldest islands, San Cristobal and Santa Cruz, exhibit higher interaction diversity and evenness, while smaller, more isolated islands, such as Santiago and Pinta, show more specialized and less connected networks. The presence of non-native ants as dominant network hubs underscores their growing ecological role in these systems, highlighting the need for conservation strategies that consider invasive species. Our findings offer critical insights into the ecological dynamics of ant-flower interactions and the vulnerability of these networks to environmental changes, with implications for biodiversity conservation in oceanic islands.

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Session 5

O33.

The role of *Apis mellifera* on plant-pollinator networks in the Seychelles Archipelago

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Islands, with their isolation, high endemism, and lower species diversity, serve as natural laboratories for studying ecosystem dynamics but are particularly vulnerable to invasive species impacts.

This study examines the influence of the invasive honeybee *Apis mellifera* on plant-pollinator networks by comparing islands with (n=2) and without honeybees (n=2). Specifically, we aim to (1) analyze the structural properties of plant-pollinator networks on islands with and without *A. mellifera*, focusing on both diurnal and nocturnal interactions to assess the honeybee's role in shaping these networks, and (2) evaluate shifts in pollination interactions caused by the presence of *A. mellifera*, including changes in visitation patterns and potential disruption to native pollinator species.

Fieldwork was conducted between October and December 2024 in the Seychelles archipelago, using diverse data acquisition methodologies: (1) direct observations from 7 am to 6 pm, (2) automated cameras recording 5-min video loops with 10-minute intervals (from 6 am to 5:30 am), and (3) interval-shooting cameras capturing one photo every 2 min over a 24-hour cycle. Preliminary findings suggest that *A. mellifera* reduces visitation rates of native pollinators, including both invertebrates and vertebrates. The presence of honeybees leads to significant differences in the structure of plant-pollinator networks between invaded and uninvaded islands, which could impact the resilience of plant-pollinator communities to further disturbances. By incorporating data on nocturnal pollinators, our study offers a more comprehensive understanding of the full impact of *A. mellifera* on island ecosystems and provides valuable insights for developing effective conservation strategies.

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Session 5

O34.

Long-term dynamic and mechanisms of pollinator sharing in plant-pollinator network

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Understanding the stability of plant-pollinator networks over time is crucial for conserving biodiversity and ecosystem services. Our study investigates interaction dynamics within a community of co-flowering plant species, focusing on pollinator sharing and long-term dynamics. We use a decade-long dataset from the Czech Republic, covering annual fluctuations in pollinator abundance and floral availability. We identify the patterns in plant-pollinator interactions affecting pollinator sharing among co-flowering species. Initial findings highlight that (1) Pollinator share a significant role in shaping community-wide pollination patterns, and (2) temporal changes in pollinator composition influence which plant species benefit most from shared pollination services.

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Session 6

O35.

Characterization and temporal variation of the gut microbiota of the bumblebee *Bombus pascuorum* in Gorbea Natural Park (Northern Iberian Peninsula)

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Gut microbiota of pollinators plays a crucial role in the health of their hosts. Given the essential role of bees in ecosystems and their current decline, it is vital to enhance our understanding of the composition and variation of their microbiota. This study investigated the gut microbiota of *Bombus pascuorum* in Gorbea Natural Park, aiming to characterize its diversity and asses temporal and spatial variations. More than 125 *B. pascuorum* specimens were collected from 16 sites between April and July 2023, and their gut contents were analysed using 16S rRNA metabarcoding to examine microbiota diversity and its variation. A total of 265 amplicon sequence variants were identified, revealing simple gut microbiomes dominated by 3 bacterial taxa. The gut microbiome of *B. pascuorum* showed bacterial species similar to those found in other *Bombus* species, indicating a high similarity in bacterial communities among species within the same genus. Nevertheless, significant differences were observed between the microbiomes of *B. pascuorum* and honeybees, with certain generalist species absent in *Bombus*. No significant variation was observed in the gut microbiome of *B. pascuorum* across different sites, which likely represent a metapopulation. However, clear temporal variation was observed, with a marked increase in bacterial species diversity in the microbiome during June and July, coinciding with greater floral diversity. These findings suggest that while there is overlap in the core gut microbiota among different pollinator genera within the Apidae family, there are also unique microbial strains that may reflect differences in their biology, diet, and ecological interactions.

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Session 6

O36.

Pathogens' transmission and environmental impacts on wild bee populations in Portugal

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Wild bees are essential pollinators, yet recent threats, particularly from pathogens and human-driven environmental changes, have endangered their populations. The transmission of pathogens from managed honey bees (*Apis mellifera*) to wild pollinators is more widespread than previously believed, primarily occurring through the ingestion of contaminated pollen or nectar while foraging on flowers. This study aimed to evaluate the epidemiological status of 11 bee pathogens in wild bees sampled across the Coimbra province (Portugal) in four distinct areas (urban, agricultural, mountainous, and coastal). Sampling was conducted at two sites per area, with and without the presence of *A. mellifera*. A total of 1502 adult wild and honey bees were collected, and pathogen presence was assessed using qPCR assays, which evaluated the prevalence and abundance of 6 viruses (DWV, CBPV, ABPV, KBV, SBV, and BQCV), *Nosema ceranae*, and 3 trypanosomatids (*Crithidia bombi, C. mellificae*, and *Lotmaria passim*). Results showed DWV as the most prevalent pathogen (87.2%), followed by BQCV (70.7%), *N. ceranae* (48.9%), and CBPV (30.1%). Pathogen infections were distributed similarly between wild and honey bees, except for ABPV, which was associated specifically with *A. mellifera*. Environmental differences showed higher DWV and *N. ceranae* in coastal areas, and more BQCV but less CBPV in agricultural zones. The mountain area had lower *L. passim* prevalence. From a One Health approach, it is essential to investigate the health of wild bees further to understand pathogen epidemiology better. Ongoing monitoring programs are crucial to assess the impact of these pathogens on bee populations.

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Session 6

O37.

The role of olfaction in cuckoo bumblebee host-finding behavior: choice experiments on the accuracy and drivers of invasion

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Cuckoo bumblebee queens are unable to rear their own workers and must successfully locate and invade a colony of their host bumblebee species to achieve reproductive success. The sense of smell plays a large role in the lives of social insects, who use it to differentiate sisters and strangers within the colony setting. It has also been suspected that cuckoos use scent when locating a host colony. To understand the role of scent in this host-parasite system, we conducted a series of choice experiments with wild-caught cuckoo bumblebees *Bombus vestalis* and lab-reared colonies of their host *Bombus terrestris*. Female cuckoo bumblebees were introduced to a flight arena containing four identical opaque boxes, each of which featured holes to release volatiles from a colony placed within. When only one box contained a host colony, the cuckoos were significantly able to locate their hosts among the four boxes. When *B. terrestris* brood, workers, and the queen were placed in separate opaque boxes, the cuckoos did not make a clear choice among them, but still avoided the empty control box. This is an initial step in understanding host detection in cuckoo bumblebees.

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Session 6

O38.

Unravelling context and density-dependent outcomes in the interaction between overabundant ungulates and a pervasive mediterranean shrub

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Seed dispersal is one of the most important plant-animal interactions for ecosystem dynamics, as it determines the initial spatial template in which post-dispersal processes are manifested. Endozoochory consists in seed dispersal in animal interiors, which can involve substantial costs for the plant (e.g. destruction of ingested seeds). Here, we investigate the overlooked interactions between overabundant ungulates and the common shrub *Halimium halimifolium* in two sites of the Doñana National Park (SW Spain). Firstly, we evaluated the frequency of visits by ungulates to flowering shrubs using camera-trapping. Then, we conducted weekly herbivory monitoring of ripe and unripe fruits. Finally, we collected ungulate faeces comprising seeds and, via faecal analysis and germination experiments, analysed the costs and benefits of their relationship. Camera-trapping revealed that the red deer, *Cervus elaphus*, was the most frequent consumer of *H. halimifolium* leaves, flowers, and ripe and unripe fruits. Herbivory monitoring suggested that most fruits ingested by deer were immature (74%), which comprise undeveloped and extremely soft seeds. However, we found some mature seeds in deer faecal samples. Only about 17% of mature seeds ingested by red deer germinated, a low proportion compared with control seeds (40%), indicating that passage through its digestive tract reduces germination rate. Despite such low germination rate, highly mobile red deer seem to have a strong potential as long-distance seed dispersers. The interaction between *H. halimifolium* and red deer is characterized by costs and benefits which likely change in space and time depicting a dynamic mutualism-antagonism continuum.

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Session 6

O39.

Human outdoor recreation affects animal-mediated seed dispersal in a highly touristic protected area

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Outdoor recreational activities are currently growing at unprecedented rates, increasing human pressures on natural ecosystems, including protected areas theoretically designed to protect biodiversity and its associated ecological processes. This may adversely impact not only species abundance and fitness, but also the resistance and resilience of ecosystem functioning. We investigated the effects of outdoor recreation on animal-mediated bilberry (*Vaccinium myrtillus*) seed dispersal in Tatra National Park (Poland), an alpine protected area visited by millions of tourists yearly. Specifically, we collected avian and mammalian feces containing bilberry seeds in transects established in both restricted and public access areas of Tatra National Park. Then, we examined the effects of outdoor recreation on the diversity (i.e. species richness and number of effective species) and composition of the seed disperser assemblage and on the quantity of seeds dispersed. We found that outdoor recreation did not strongly affect the diversity of bilberry seed dispersers, with similar numbers of species registered in restricted and public access areas. However, outdoor recreation affected the composition of the assemblage of dispersers, with different species found in restricted and public access areas. We additionally found that the quantity of seeds dispersed by frugivores was negatively affected by outdoor recreation, with almost 20 times less bilberry seeds being dispersed in the areas open to the public. Our results suggest that human leisure activities may negatively affect seed dispersal by animals in protected areas, potentially affecting plant community dynamics and ecosystem functioning.

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Session 6

O40.

Citizen science education for pollinator safeguard: the Students 4 Pollinators project

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“POLLINATORS ARE IN DANGER!” Despite this message having reached most people, it is generally oversimplified and often misunderstood. Much still needs to be done to increase awareness and knowledge on this issue, starting from illustrating the diversity of pollinators and plants, as well as the pollination process and its multiple benefits. By educating young generations we can effectively stimulate participative citizenship towards more sustainable behaviours and pollinator conservation.

The citizen science project Students 4 Pollinators was implemented in Italy, Spain and Greece within the LIFE 4 Pollinators EU project (LIFE18/GIE/IT000755). The program is detailed in the Citizen Science handbook, distributed to participants together with simplified field guides to main pollinator and plant groups. Training of teachers and educators was conducted to increase the number of students involved and enable replication. Moreover, extra activities were often performed (e.g. drawing competition, artistic installations).

Overall, from 2021 to 2024 approximately 1500 secondary school students participated, and 148 teachers were trained. Learning outcomes and project effectiveness have been assessed through questionnaires. The analysis of 460 replies by Italian students show a moderate increase of their knowledge and awareness (27%), but higher willingness to adopt virtuous behaviors and to share new knowledge with families and friends. Regarding teachers, performance indicators are significatively higher than expected (86%) and the majority intend to autonomously replicate the project in the future, demonstrating the success of the workshop. In addition, the POLLINATOR-FRIENDLY certificate was assigned -to date- to 32 schools, for their commitment to help wild pollinators.

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POSTER COMMUNICATIONS

Posters

P1.

Fluctuating selection on pollination traits in *Viscaria vulgaris*

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Phenotypic selection on floral traits can vary due to spatial and temporal differences in the ecological context experienced by specific plant populations. However, there are few long-term empirical studies that assess the role of spatial and temporal variation as a factor that can lead to divergent outcomes in the patterns of phenotypic selection on floral traits in generalized plant-pollinator interactions.

In this study, we examined temporal variation in the strength and direction of phenotypic selection on floral traits in *Viscaria vulgaris*, a perennial herb that interacts with a wide diversity of pollinator taxa. We conducted phenotypic-selection studies over a period of four years (2021-2024) in a single *Viscaria vulgaris* population located in southern Sweden. For each year, we estimated and compared mean-standardized selection gradients for a suite of floral traits functionally involved in the pollination process.

We found that the strength and direction of phenotypic selection on some floral traits remained constant during the four-year study period. However, other floral traits, in particular those involved in flower-pollinator fit, experienced detectable variation in the strength and direction of phenotypic selection. Such variation may follow temporal changes in the composition of the pollinator community. We underscore that *Viscaria vulgaris* is subject to temporal variation in phenotypic selection on floral traits and that the scope for such variation is contingent on the function of each floral trait.

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Posters

P2.

Interannual differences in pollinator contributions to pollen transfer are mainly driven by changes in pollinator abundance

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Background: The contributions of pollinators to pollen transfer vary due to differences in ability to carry pollen depending on pollinator traits and variations in visitation density, i.e., abundance in relation to the number of flowering plants varying between pollinators due to differences in population size and visitation activity. Moreover, the densities vary greatly between years due to rapid changes in insect population sizes.

We aimed to estimate how much pollinator contributions to pollen transfer depend on their ability to carry pollen and their abundance. Our goals: 1) quantify the variability in pollen loads among and within pollinator taxa; 2) quantify the year-on-year variability in flower-visitation densities.

Methods: We collected data on pollen loads of 31 common Czech grassland pollinators by swabbing pollen from their body, combined with an 11-year-long time series of plant-pollinator interactions that indicates population fluctuations for each pollinator taxon.

Results: There are no large differences in the pollen loads among the pollinator taxa, but there is considerable individual variation within each group. The interaction densities significantly differed among taxa and changed over the years.

Conclusions: Understanding the variations in the contributions of pollinator taxa to pollen transfer over time is crucial to understanding the long-term community dynamics and could help in conserving pollination services amid pollinator decline. Pollinator taxa show little variance in pollen loads compared to individuals within a taxon. However, changes in pollinator densities over the years may greatly impact the contributions of different taxa to pollen transfer.

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Posters

P3.

A didactic proposal for scientific dissemination of pollination syndromes

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Se presenta una actividad didáctica de divulgación científica con el objetivo de dar a conocer a la ciudadanía las relaciones mutualistas existentes entre plantas y polinizadores.

Con este objetivo se diseñaron recursos didácticos para la aplicación de conocimientos sobre rasgos florales y polinizadores, mediante pruebas gamificadas que contienen información precisa para identificar algunas de las relaciones de polinización que se establecen en la naturaleza.

Esta actividad persigue contribuir a la formación básica sobre síndromes de polinización mediante aprendizaje activo y utilizando datos reales, así como promover el debate socio-científico sobre el problema de la pérdida de polinizadores en los ecosistemas y las consecuencias para los servicios ecosistémicos.

A didactic scientific dissemination activity is presented with the aim of raising public awareness about the mutualistic relationships that exist between plants and pollinators.

With this objective, teaching resources were designed for the application of knowledge about floral traits and pollinators, through gamified quizzes that contain precise information to identify some of the pollination relationships that are established in nature.

This activity aims to contribute to basic training on pollination syndromes through active learning and using real data, as well as promote socio-scientific debate on the problem of the loss of pollinators in ecosystems and the consequences for ecosystem services.

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Posters

P4.

Drivers of temporal stability in plan-pollinator communities: from floral resources to plant reproductive success.

Estefanía Tobajas*, Maddi Artamendi, Luis J Chueca, Paula Domínguez-Lapido, Christian Gostout, Brais Hermosilla, Jon Poza, Jennifer Rose, Xabier Salgado-Irazábal, Martina de Simón, Ainhoa Magrach.

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Temporal stability is defined as the capacity of an ecosystem to buffer environmental perturbations over time while conserving ecological functions of interest. While factors affecting temporal stability have been studied in plant communities, only a few studies have assessed the stability of pollination services. Species richness, species asynchrony or stability across aspects like flower production, or plant and pollinator abundances may influence the temporal stability in pollinator visitation rates, which can ultimately affect both the functioning (e.g., plant reproductive success) or the stability of those functions. Understanding these different relations is important to improve our understanding of how changes in plant or pollinator communities could affect ecosystem functioning. Here, we use a well-resolved data on floral resource availability, plant and pollinator interaction frequencies and plant reproductive success that includes four years of data collected at 5 sites within Gorbea Natural Park (Bizkaia) by conducting biweekly transects during the flowering season (April-July). We will introduce our framework and expect to show some preliminary results of this ongoing study for which analyses are still running. We expect that factors like greater asynchrony in plant flowering or abundance and higher pollinator diversities will increase the stability of pollinator visitation rates, which will also affect the reproductive success of different plant species. These results will be instrumental in moving beyond patterns to understanding the mechanisms driving the temporal stability plant-pollinator communities in natural systems.

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Posters

P5.

Understanding floral diversity: the role of the flower economic spectrum in tropical mountain ecosystems

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High-altitude tropical mountains, characterised by strong selection pressures such as extreme climatic conditions, low abundance and diversity of pollinators, constitute a significant portion of global biodiversity. In these environments, the flowers of zoogamous plant species constantly face a combination of abiotic and biotic selection pressures, but historically, their influence on flower diversity has been studied mainly separately. The concept of Flower Economic Spectrum (FES) has been recently proposed to understand the evolutionary phenotypic variation and diversity of functional traits in flowers that evolved under multiple selection factors. This spectrum is based upon the trade-off between flower longevity and the cost of flower production, and the plants diverge within this spectrum under the pressure of different selection factors. This concept has the potential to determine the evolutionarily successful strategies that allow plants to persist and diversify in various types of environments.

Tropical mountainous regions present critical ecological factors that profoundly affect plant reproduction, including the length of the growing season (the possibility to flower during the whole year), daily temperature fluctuations, and pollinator availability. This study focuses on the phenotypic variability of flowers in tropical alpine plants through the lens of the FES, examining their diversity across various floral traits. This research aims to uncover the adaptations that enable these plants to thrive in challenging climates, thereby providing a deeper understanding of biodiversity in high-altitude ecosystems.

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Posters

P6.

The influence of management of urban forests and parks on the ecological components contributing to plant pollination

Paolo Biella*, Elisa Milani, Massimo Labra

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A global decline of biodiversity has been taking place due to the strong impact of anthropogenic activities. However, in large cities, some refuges for pollinators persist when conditions are appropriate. Therefore, it is pivotal to understand how the management of urban green areas could promote pollinators and pollination, because species diversity, their interactions and their functional traits determine pollination success according to how urban landscape influence them. In this poster, firstly, we present a case study showing how pollinators correlate to urban forest management and the flowering community of the nearby urban meadows. Secondly, we show how park mowing frequency and several urban green area features may enhance the insect community, including pollinators. We conclude this contribution, showing a synthetic view of elements that may be relevant for pollinator enhancement strategies in urban settings, in light of the efforts within the Spoke 5 activities (Urban Biodiversity) of the National Biodiveristy Future Center (NRRP).

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Posters

P7.

Subindividual variation in phenotype and reproductive strategy throughout flowering

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The plant mating system influences their morphology and evolutionary history, but it can be variable and change in response to environmental shifts. Descriptive studies of species are often conducted within a fixed and limited timeframe of the organism's life, overlooking possible changes throughout its entire lifecycle. This can lead to inaccurate descriptions. In this study, we track the morphology, reproductive investment, and potential changes in the mating system throughout the entire flowering period of *Erysimum wilczekianum*, an annual, outcrossing, and monocarpic crucifer. A first experiment was conducted under controlled conditions and in the absence of pollinators; controlled crosses were made from the beginning to the end of the reproductive stage, and reproductive investment, fecundity, abortion rates, and reproductive success (seed set) were evaluated throughout the plant's life. Additionally, in a second experiment conducted with the same types of crosses, the phenotype of floral traits was monitored. The results showed a decrease in floral size and ovule investment as the relative position of the flowers increased. Conversely, traits related to the relative position of reproductive organs and fecundity were more influenced by the level of outcrossing experienced by the plant. Additionally, variation in the reproductive system appears to be subject to natural selection. These phenotypic changes and investment patterns suggest a shift in the reproductive system of our study species. The reproductive system can be a dynamic trait, especially in highly variable environments like the Mediterranean. It is intriguing to see how a changing mating system can be subject to selective events and therefore be adaptive, helping plants to withstand significant environmental changes.

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Posters

P8.

Shifts in the phenology of a Mediterranean pollinator community under climate change

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Climate change affects natural communities in a number of ways, including by altering the phenology of plants and animals. These shifts can have cascading effects when considering the range of organisms that interact in highly diverse communities, as temporal mismatches between interacting partners may occur. In the Northern Hemisphere, it is well known that the flowering phenology of plant species is advancing in response to climate change. Moreover, the fastest rates of this shift have been observed in the Mediterranean region. However, it remains a challenge to know whether pollinator communities are shifting accordingly. The occurrence of temporal mismatches between flowering plants and pollinators could potentially endanger the survival of insect species and compromise pollination services.

This study aims to describe the direction and magnitude of the temporal shift in the activity of insects belonging to the four main pollinator orders: Hymenoptera, Diptera, Lepidoptera and Coleoptera, between two periods 35 years apart in the north of the Doñana National Park (Spain). In this area we have already documented the shift in the flowering phenology of the plant community.

We recorded the visits of insects to the flowers, carrying out dynamic censuses of a diverse plant community every week from 1985 to 1987, and we repeated the same methodology from 2020 to 2022. We then used circular statistics to compare the temporal distribution of insect activity. We also compared our data with censuses carried out between 1982 and 1984 at a nearby site in Doñana. This is an ongoing study.

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P9.

Spatial and temporal dynamics of plant-pollinator network structure and its influence on reproductive success

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The interactions between species and the ecological networks they form represent a fundamental aspect of ecosystems and their functions. These interactions vary according to community composition and the turnover of species throughout the year and between years, which can affect key ecological functions such as pollination. In this study, we examine the temporal and spatial dynamics of the structure of interaction networks at the community and plant species level in Doñana National Park, which has a Mediterranean climate, and Gorbea Natural Park, which has an Atlantic climate. Furthermore, the role of network structure in the reproductive success of specific plant species was investigated, with the number of fruits per flower and the number of seeds per fruit serving as the key metrics. It was observed that, particularly in Gorbea, nestedness and functional complementarity vary considerably throughout the season, although they demonstrate consistent patterns across the three years of sampling. In Doñana, the highest nestedness rates were observed in mid-season, while functional complementarity exhibited a progressive decline throughout the season in both sampling years. Additionally, plant richness was found to have a negative impact on the reproductive success of the species studied. Conversely, in Gorbea, functional complementarity of pollinators was identified as a positive contributor to the reproductive success of plants. The findings indicate that alterations in species turnover may influence the functional role of species, and subsequently, network structure and ecosystem functioning.

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Posters

P10.

A closer look at foraging and pollination behavior of *B. pascuorum* through comparison of field observations with genetic data from gut specimens

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Wild pollinators maintain indispensable ecosystem services that support biodiversity and global agricultural systems. Developing more efficient and informative methodologies for observing pollinator ecology will lead to better management and conservation of these services. Genetic tools enhance our ability to detect plant-pollinator interactions that may be unobserved by traditional field surveys and expand opportunities to understand patterns in pollination networks. Application of such tools to plant and pollen DNA carried externally or in the gut contents of pollinators provides greater detail on interactions. We use metabarcoding to reveal important forage species for the wild bumblebee species, *B. pascuorum*, using DNA extracted from specimen guts. These literal insights into forage selection provide complementary information to field observations of bumblebee-plant interactions. We analyze 270 interaction data from surveys of 16 sites over a four month period and plant presence data obtained via metabarcoding of gut DNA from 127 *B. pascuorum* specimens, using the rbcL gene fragment. The result is a preliminary comparative analysis of our genetic and field data. We propose the comparison of these datasets as a proof of concept model for verification of genetic data as used in this context. We also demonstrate that the complementary nature of these datasets has potential to reveal further insights into pollinator ecology.

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Posters

P11.

The effect of environment on pollinator spectra composition of Devil's-bit scabious (*Succisa pratensis*) and on pollen transfer

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Pollen transfer of most flowering plants depends on insect pollinators. A large amount of these plants are visited by wide pollinator spectra, which differ in the effectivity of pollen transfer and contribution to flower reproductive success. This generalization of the pollinator spectrum has many benefits, for example, mating opportunities in unpredictive conditions. Pollinator spectrum is dependent on the environmental conditions and can differ a lot in different parts of the plant's population. But the question is whether the changes in pollinator spectra influence the flower pollen transfer?

The goal of this work is to find out how changing environmental conditions affect the composition of the pollinator spectrum in separated populations of *Succisa pratensis* located in CHKO Slavkovský les. The second task is that changes in the plant pollinator spectrum can influence their reproductive success. This work contains two types of study, that are being realized in areas along CHKO Slavkovský les, which are settled before. The first set of experiments is about observing pollinators, their activity on flowers, and changes in the pollinator spectrum. The second set of experiments is related to quantification and collecting pollen from a separated population of *Succisa pratensis.*

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Posters

P12.

Effects of climate change on flowering phenology of mediterranean plants.

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Phenology, the study of the seasonal timing of biological events, is a key indicator of how plants immediately respond to environmental changes. In the context of climate change, shifts in phenological events are becoming increasingly important for understanding how plant species are impacted by currently changing climatic conditions.

This study focuses on the flowering and fruiting phenology of Mediterranean species, a region highly vulnerable to climate change. Using herbarium specimens as a historical dataset, this work aims to determine whether shifts in flowering and fruiting times correlate with changes in temperature and precipitation over the past century. Herbarium records, with their long-term coverage, provide a unique opportunity to analyze temporal trends in plant phenology, with appropriate bias corrections.

Preliminary results suggest a trend of earlier flowering in some species, potentially linked to warming temperatures, but not in others despite they may co-occur. Given the inconsistent responses of species, these findings are crucial for forecasting future shifts in communities and ecosystems and developing effective conservation strategies.

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Posters

P13.

Effect of ploidy variation on the female reproductive investment across whole plant life

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Variations in reproductive investment during plant life are related to different mechanisms of compensation and inform us about the reproductive strategies of these organisms. In this experiment, we explore the differences between three ploidy levels related to the female reproductive investment in a selfing species complex. This is "*Erysimum incanum*" species complex including diploid, tetraploid and hexaploid plants. Plants from the different ploidies were grown in greenhouse conditions. Once the plants were ripped, we quantified the number of ovules, aborts and seeds produced per flower along the flowering stalk. Therefore, we found no difference between ploidies in the relation of ovules in the beginning and across the plant life, but we did found differences when we compare the production of ovules across and in the end of the plant life. Plants that invest more ovules at the end increase their production across the life as its ploidy decreases. Also, the increase in investment throughout life is negatively related to fitness, as ploidy increases. We also found an association between plant reproductive strategies and plant total fitness. Our results suggest that the changes in ploidy generate compensation strategies in these species complex.

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Posters

P14.

Effects of introduced rabbits on the diversity, pollination and reproduction of native flora under insular conditions in Menorca.

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Despite covering only 5% of Earth's surface, islands harbour approximately 30% of known species due to evolutionary processes shaped by geographic isolation. This isolation fosters exceptional biodiversity, including many endemic species. However, this biodiversity is threatened by the introduction of invasive herbivore species, such as rabbits, which exert strong pressure on native flora. In this study, we investigated the impact of rabbits on the diversity, pollination and reproduction of native plant species in Menorca (Balearic Islands). To achieve this, we established 24 rabbit exclusion fences alongside 24 adjacent control plots, where rabbits were present. Rabbit latrines were monitored to estimate population density, and surveys were conducted to measure plant species composition, pollinator activity, and flower and fruit production. Initial results showed no significant differences in species richness or diversity indices between exclusion and control plots. However, flower production was notably higher in exclusion plots with high latrine densities, likely due to soil enrichment from nutrient-rich latrines. Pollination surveys showed bees and beetles as the most frequent pollinators, with similar visitation rates across both control and exclusion plots. Despite comparable pollinator activity, fruit set for highly palatable plant species was higher in exclusion plots, indicating that reduced herbivory stress enhances reproductive success. Our findings highlight the dual role of rabbits as herbivores and nutrient cyclers. While rabbit exclusion boosted fruit production, overall plant and pollinator diversity remained stable, suggesting ecological resilience. Maintaining plant-animal interactions is critical for sustaining biodiversity in island ecosystems, even in the face of invasive herbivores.

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Posters

P15.

Factors that influence the level of specialization

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Specialization in pollinator-plant relationships is one of the most important concepts driving the coevolution and ecology of these interactions. Some plants are highly specialized, relying on a narrow group of specific pollinators. However, most plant species are visited by a broader range of pollinators. What factors influence pollinators to choose certain plant species within a pollination network?

Is pollinator specialization influenced by plant diversity, flower color, or flower shape?

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Posters

P16.

Double mutualism between lizard and globose cactus in the Brazilian Caatinga: further evidence in poor-resource environments

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In arid and semi-arid regions, resource scarcity during certain times of the year can lead animal and plant species to develop adaptive strategies, such as generalist behaviors. In this study, we discuss an ecological relationship in which the lizard *Tropidurus cocorobensis* Rodrigues, 1987, and the cactus *Melocactus violaceus* subsp. *margaritaceus* N.P.Taylor engage in a double mutualism in the Caatinga—a seasonally dry tropical forest in Northeast Brazil. In this interaction, *T. cocorobensis* feeds on the nectar and pollen of *M. violaceus*, transferring the pollen grains to the stigma of another flower, and acting as a potential pollinator. Additionally, the lizards consume the fruits and disperses the seeds of *M. violaceus*, also contributing to its dispersal. *Melocactus violaceus* exhibits continuous flowering and fruiting throughout the year, with both? peaks during the dry season (September to December). The flowers, which are pink, tubular in shape, and contain concentrated nectar, attract the lizards, and the morphological compatibility between the small pink flowers and the size of *T. cocorobensis's* mouthparts is crucial for this double mutualism. The findings highlight the importance of *Tropidurus* lizards in the reproductive success of *Melocactus* species. Although it is not an exclusive relationship — as the lizard uses other food sources and the cactus relies on other pollinators and seed dispersers — the mutualistic interaction between them is very strong. Therefore, the conservation of both species is essential for maintaining this balance which probably provides resilience to the system, particularly in seasonal environments with resource scarcity, such as the Caatinga.

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Posters

P17.

Assessing the influence of forest cover and local habitat structure on the abundance of the butterfly *Heliconius sara* (Nymphalidae) and its floral interactions in the Atlantic Forest of Southern Bahia, Brazil

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Land-use changes from intensive agriculture and urbanisation drive habitat loss, a major cause of global biodiversity decline, disrupting plant-animal ecological interactions. This study examines how forest cover and local habitat structure affects the abundance of the butterfly *Heliconius sara* and its floral interactions in Atlantic Forest remnants in Brazil. *Heliconius* butterflies are pollen feeders and potential pollinators. We also tested how *H. sara* individual traits affect their role in the butterfly-flower interaction network. We surveyed 18 forest fragments across a forest cover gradient. Butterfly sampling was conducted, and interactions were identified by the presence of pollen on the collected butterflies. Forest cover was quantified using satellite imagery, while habitat structure was evaluated through tree species richness, mean and maximum tree height, basal area, and canopy openness. Eye size and wing length were analyzed as functional traits of *H. sara* to evaluate their association with individual generalization degree. We found no significant association between forest cover, habitat structure, and butterfly abundance. Pollen, from a total of 19 morphotypes, was found on 40 of 42 individuals collected. A total of 138 butterfly-flower interactions were detected, but the interactions number in a remnant fragment was not associated to forest cover either. The degree of generalization of each individual was not found to be associated to the measured morphological traits of the butterflies including their sex. Despite the lack of significant associations, the presence of diverse pollen types on individuals underscores the ecological role of *H. sara* as a floral visitor and potential pollinator.

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Posters

P18.

Geographical variation in floral traits and pollination environments in the *Dalechampia scandens* complex in Costa Rica

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Dalechampia scandens is a vine in Central and South America characterized by an unusual pollination system. The species offers resin as reward that is used by female Euglossine and Megachilid bees to construct their nests. Previous research has provided evidence that the variation of traits involved in the location and visual attraction of blossoms, together with the amount of reward offered is important for bee visitation, and therefore the function of pollination. This, in turn, affects the fit of bees with traits involved in pollen pick up and deposition. In the present study, we investigated several populations in Costa Rica. We used the geographic variation to investigate whether populations differ in floral traits and if this variation is related to the pollinators. We measured morphological traits of the blossoms, including herkogamy, the amount of reward offered and the size of traits involved in advertisement. We conducted pollinator observations to describe the bee community at each locality and counted the number of pollen grains present on the stigmas during the female-phase (before male flowers opened) after bee visitation. Our data reveals that there is a significant variation in blossom traits and the presence of a reduced herkogamy within populations.

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P19.

Impact of reference choice on population genomic diversity estimates

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Genetic diversity is key to the survival of species, making its quantification and monitoring essential for the conservation of threatened taxa. High-throughput sequencing technologies allow for the estimation of genetic diversity by analyzing positions across the entire genome. However, this task can be hindered by the lack of reference genomes closely related to the species of interest, which are often non-model organisms. In this study, we evaluated the effect of using non-conspecific references on the estimation of population genetic diversity.

We downloaded whole-genome sequencing reads for 20 individuals from public databases ENA and NCBI GenBank for the species *Oryza sativa*, *Beta vulgaris*, *Linum usitatissimum,* and *Arabidopsis thaliana*, along with their respective reference genomes and those of phylogenetically related species. For each genus, we generated 100 groups of 15 randomly selected individuals and estimated nucleotide diversity (π) by aligning the reads of each individual against different references.

The results show that the calculated genetic diversity is significantly affected by the reference used, even when it belongs to the same genus. Although genetic diversity is underestimated as the phylogenetic distance between the study species and the reference increases, the proportion of aligned bases does not fully explain the error in diversity estimates. At low mapping coverage, diversity remains constant (and low) across the four groups, suggesting that the few aligned sequences correspond to highly conserved regions.

This analysis highlights the importance of carefully selecting the reference genome for quantifying genetic diversity, as estimates obtained using closely related species may not be accurate.

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Posters

P20.

Flowers and flight: how area, isolation and floral diversity shape pollinator communities on small Italian islands

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In recent decades, pollinators experienced a significant decline due to climate change, introduction of alien species and pathogens, intensive agriculture and urbanization. In this context it is crucial to gain knowledge on the distribution of these fundamental animals. In the small Italian islands, data on the composition of pollinator fauna and associated ecosystem services are either non-existent or limited to a few case studies, together with the fact that bees are particularly difficult to identify, compromising any possibility of biodiversity conservation.

This study focuses on characterizing pollinator communities on small Italian islands (Ventotene, Santo Stefano, Procida, Ischia, Capri) and assessing the effects of area, isolation and floral diversity of the island, with comparisons to mainland sites (Rome, Naples, Circeo National Park). The 588 specimens collected were identified using an integrated approach, combining molecular techniques (DNA barcoding) with morphological identification.

The results highlight that island environments are heavily influenced by physical and ecological factors, leading to simplified and disharmonic biological communities compared to the mainland. While pollinator richness is dependent on isolation (negatively) but not by area (small island effect), flowering plant diversity was the most crucial variable. Despite the vulnerability of islands, they can sustain significant biodiversity and resilience through the conservation of natural resources, like floral diversity.

This study provided insights into ecosystem dynamics in islands as ideal models for understanding biodiversity and ecosystem resilience, with applications in conservation and landscape restoration.

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Posters

P21.

Geranium dolomiticum, fighting for survival in the dolomite islands of El Bierzo (León)

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Biodiversity conservation requires a deep knowledge of biology, and the reproductive fitness of the species involved, for which it is compulsive to have a long-time project including a detailed schedule, periodical monitoring and conservation actions to assess their extinction risk and to base solutions on the real problems. After some 25 years of practice in plant conservation in Spain, our knowledge of some species is very good for understanding the current situation. One case is the orophilous *Geranium dolomiticum* Rothm., a narrow endemic associated with the dolomitic outcrop's islands in El Bierzo (León, Spain), places that are known because they often host unique and narrowly endemic plants. This species only lives in two close locations separated by some 5 km. The global population is fragmented because both subpopulations are isolated, functionally representing a single locality defined by the pressures. Although it is not evaluated by the IUCN Red List, it is one of the most threatened of the Spanish vascular plant species evaluated for the domestic Spanish Vascular Plants Red List, due to its limited distribution and the severe threats originated by infrastructures around both reproductive populations: several changes in the land use including presence of livestock, infrastructures, or forestry, and the diminution of pollinator abundance due to severe fires and climatic change, but also several intrinsic threats related to the reproductive fitness, and the low seed set. The population has been monitored for a long time (2005-2023). Active and intensive searches for this species in areas with presumed suitable potential habitats in the perimetric zones of the location of both reproductive populations have not been successful. Therefore, only the existence of two subpopulations is confirmed. Currently, there is a very low degree of uncertainty regarding the calculated parameters, although the historical calculations were less precise. The reduced extent of occurrence (EOO = 3,8 km 2) and area of occupancy (AOO= 0,48 km 2) conditioning the risk of the species. The population size has been recorded through the five inventories conducted. The historical population size was estimated at some 100.000 individuals, probably overestimated by the method based on flowering shoot number, discrete units used to calculate individuals. The last two censuses (2018, 2023) were made by m 2 having the presence of the species. As expected, the final calculation was much lower (12.000-13.000 individuals), for decreasing of the species but more precise censuses. In addition, we recover data about the population structure, genetic diversity, flower production, pollinator diversity and abundance, which can affect the plant's reproductive success. In this point, conservation activities are needed at a broad front, including research, education, in-situ and ex-situ conservation and ecosystem protection.

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