ABSTRACT BOOK OF THE INTERNATIONAL SYMPOSIUM FloraMac2022

San Sebastián de La Gomera
Canary Islands

12-16 September 2022

ABSTRACT BOOK

INTERNATIONAL SYMPOSIUM

FloraMac2022

San Sebastián de La Gomera, Canary Islands

12-16 September 2022

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PRESENTATION

FloraMac 2022 is an international symposium that aims to bring together during a week, both senior and novel local-based or continental researchers working on different disciplines (i.e. taxonomy, ecology, biogeography, reproductive biology, vegetation science, genetics, phylogeography, paleoecology, evolutionary biology, conservation biology, history of science, etc.) regarding the terrestrial and marine flora and vegetation of the Macaronesia biogeographical region (Azores, Madeira, Salvages, Canaries and Cabo Verde).

FloraMac (diminutive of Flora of Macaronesia) conferences started in summer 2010 with the very first event held in Ponta Delgada (São Miguel) in Azores and hosted by the University of Azores. Two years later, it moved to another Macaronesia archipelago, this time Madeira, where the University of Madeira organized the 2nd FloraMac event in summer 2012. It was not until summer 2015 when FloraMac jumped for its first time to the Canaries, specifically to Gran Canaria, where the Jardín Botánico Canario "Viera y Clavijo" - Unidad Asociada al CSIC, hosted the 3rd FloraMac event in Las Palmas de Gran Canaria. Three years later FloraMac jumped back to Madeira, where our colleagues from the University of Madeira organized the 4th FloraMac event, which took place in summer 2018. Finally, a couple of years ago the University of La Laguna and the Institute of Natural Products and Agrobiology – IPNA CSIC (Tenerife) assumed the responsibility of organizing the 5th FloraMac event, which although initially scheduled for summer 2021 was inevitably postponed due to the COVID pandemic to September 2022 and take place in San Sebastián de La Gomera.

FloraMac conferences continue with the tradition that started ca. 50 years ago in 1973 in Las Palmas de Gran Canaria (Canary Islands), followed in 1977 by the 2nd event in Funchal (Madeira), with the organization of a regional symposium called "Congreso Internacional Pro-Flora Macaronésica" that gathered researchers working with very different approaches in the terrestrial and marine flora and vegetation of the Macaronesia Region. Some decades later, this event was replaced with the "International Symposium Fauna and Flora of the Atlantic Islands" which took place as much as five times in several places (1st in Funchal, Madeira in 1993; 2nd in Las Palmas de Gran Canaria, Canaries in 1996; 3th in Ponta Delgada, São Miguel, Azores in 1998; 4th in Praia, Santiago, Cabo Verde in 2000, and 5th in Dublin Ireland in 2004), before its final disappearance.

In this book you will find all the abstracts of the contributions presented by invited researchers, oral communications, and posters of the fifth FloraMac conference, which take place in San Sebastián de La Gomera (Canary Islands) between the 12th and 16th of September 2022.

The organization committee

FloraMac2022

San Sebastián de La Gomera, Canary Islands
12-16 September 2022

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GARAJONAY PARQUE NACIONAL

PROGRAMME

Schedule	Monday 12	Tuesday 13	Wednesday 14	Thursday 15	Friday 16
9.00-9.30	Opening act	Keynote speaker: **Brezo Martínez**	**Excursion** to Garajonay National Park or Valle Gran Rey coastline	Keynote speaker: **Maria Romeiras**	Keynote speaker: **Eva Cacabelos**
9.30-10.00	Inaugural conference **Ángel Fernández**				
10.00-11.00	Keynote speaker: **Viviana Peña**	Oral presentations **Session 3**: **Plant ecology - community dynamics**		Oral presentations **Session 6**: **Flora and vegetation - reproductive biology**	Oral presentations **Session 9**: **Management and conservation**
11.00-11.30	Coffee break	Coffee break		Coffee break	Coffee break
11.30-13.00	Oral presentations **Session 1**: **Island biogeography - colonization and diversification**	Oral presentations **Session 4**: **Plant ecology - the impact of climate change**		Oral presentations **Session 7**: **Flora and vegetation - taxonomic novelties**	Keynote speaker: **Yurena Arjona** (11.30-12.30) Oral presentations **Session 10**: **Management and conservation** (12.30-13.15)
13.00-14.30	Lunch break	Lunch break		Lunch break	Lunch break (13.15-14.30)
14.30-15.30	Keynote speaker: **Carlos García-Verdugo**	Keynote speaker: **Ruben Heleno**	Free time	Keynote speaker: **Christophe Vieira**	**Awards and Closure** (14.30-15.30)
15.30-17.00	Oral presentations **Session 2**: **Island biogeography - patterns and processes**	Oral presentations **Session 5: Plant ecology - ecological succession and the associated mechanisms of adaptation**		Oral presentations **Session 8**: **Flora and vegetation – molecular evolution** (15.30-16.15) Poster session (16.15-17.00)	
17.00-17.30	Coffee break	Coffee break		Coffee break	
17.30-19.00	Poster session	Poster session		Poster sesión (17.30-18.15)	
20.00				Conference dinner	

PROGRAMME – Oral sessions

	Monday, 12th September 2022
8:00-onwards	Registration
9:00-9:30	**Opening**
9:30-10:00	**Introduction to the flora and vegetation of La Gomera and its conservation.** **Ángel Fernández**
10:00-11:00	**Keynote: Coralline red algae of the Macaronesian region: uniqueness and biogeographical relationships.** **Viviana Peña**
11:00-11:30	Coffee break
	Session 1: Island biogeography - colonization and diversification
11:30-11:45	**OP1**: Trait-dependent diversification and biogeography of Canary Island angiosperms: a community-wide approach. Ryan Brewer et al.
11:45-12:00	**OP2**: No country for the ubiquitous: The origins and diversification of the Canarian endemic plants considered to be distributed in all islands. Juli Caujapé-Castells et al.
12:00-12:15	**OP3**: Patterns of diversification and colonization in Macaronesian Apiaceae lineages: Ecological and cytogenomic approach. Guilherme Roxo et al.
12:15-12.30	**OP4**: Similar, yet different: contrasting macro and microevolutionary histories in the Canarian endemics *Kleinia neriifolia* and *Euphorbia balsamifera*. Mario Rincón-Barrado et al.
12:30-12:45	**OP5**: Inter-island colonization and evolutionary processes in the Canarian endemic genus *Parolinia* Webb (Brassicaceae): implications for conservation in a biodiversity hotspot. Miguel Á. González-Pérez et al.
12:45-13:00	**OP6**: Evaluation of BEAST2 substitution rate-based calibration models as an alternative to the widely used fossil-based models in an automated pipeline to compute divergence times in the Macaronesian flora. Antonio Díaz-Pérez et al.
13:00-14:30	lunch break
14:30-15:30	**Keynote: Island syndromes and Macaronesian plants.** **Carlos García-Verdugo**
	Session 2: Island biogeography - patterns and processes
15:30-15:45	**OP7**: Patterns and drivers of beta diversity across geographic scales and lineages in the Macaronesian flora. Lea Mouton et al.
15:45-16:00	**OP8**: The evolution of insular woodiness. Frederic Lens et al.
16:00-16:15	**OP9**: Island disharmony of the bryophytes community of Macaronesia. Sébastien Mirolo et al.
16:15-16:30	**OP10**: Diversity of useful plants in Cabo Verde islands: a biogeographic and conservation perspective. Isildo Gomes et al.
16:30-16:45	**OP11**: Biogeographic origins and drivers of alien plant invasions in an oceanic archipelago. Jairo Patiño et al.
16:45-17:00	**OP12**: Source areas and dispersal patterns within the Macaronesian flora. José María Fernández-Palacios et al.
17:00-17:30	coffee break
17:30-19:00	**Poster sesión**

	Tuesday, 13th September 2022
9:00-10:00	**Keynote: Predicting the distribution of macroalgae in a changing climate**. **Brezo Martínez**
	Session 3: Plant ecology - community dynamics
10:00-10:15	**OP13**: Soil properties, but not biodiversity facets, mediate productivity in the Canary Islands and mainland Spain. Maria L. Tolmos et al.
10:15-10:30	**OP14**: Differences in soil bacterial and fungal community structure between natural, production forest and exotic woodland, as revealed by metabarcoding in an Atlantic Island. Ângela Vieira et al.
10:30-10:45	**OP15**: Summit vegetation responses to cultural landscape transformations in the Teide National Park, Tenerife, Canary Islands. Lea de Nascimento et al.
10:45-11:00	**OP16**: Phytoliths in modern plants from the Canary Islands as a reference for the reconstruction of long-term vegetation change and culture-environment interactions. Álvaro Castilla-Beltrán, Enrique Fernández-Palacios et al.
11:00-11:30	coffee break
	Session 4: Plant ecology - the impact of climate change
11:30-11:45	**OP17**: Quantitative wood anatomy of eight dominant tree species from Macaronesian laurel forests. María A. García-López et al.
11:45-12:00	**OP18**: Taxonomic, functional and phylogenetic diversity of bryophytes along an elevation gradient across an oceanic island (Madeira). Anabela Martins et al.
12:00-12:15	**OP19**: Climate change impact in laurel forests at Garajonay National Park. Luis A. Gómez et al.
12:15-12.30	**OP20**: Vulnerability of cloud forests to climate change: what can we learn from high-resolution climatologies in a topographically complex oceanic archipelago? Flavien Collart et al.
12:30-12:45	**OP21**: The geographic context rules the miniaturization and shift of *Gongolaria abies-marina* forests: fifty years of data reveal drastic changes in the organization of benthic communities. Carlos Sangil et al.
12:45-13:00	--
13:00-14:30	lunch break
14:30-15:30	**Keynote: Run forest, run! An ode to the importance of seed dispersal.** **Ruben Heleno**
	Session 5: Plant ecology - ecological succession and the associated mechanisms of adaptation
15:30-15:45	**OP22**: The fate of vegetation during an oceanic island volcanic eruption (Tajogaite volcano, La Palma Island). María Guerrero-Campos et al.
15:45-16:00	**OP23**: First stages in shallow subtidal algal colonization of Tajogaite lava deltas (La Palma, Canary Islands). Daniel Álvarez-Canali et al.
16:00-16:15	**OP24**: Changes in antioxidant activity of fresh marine macroalgae from the Canary Islands during air-drying process. Marcos A. Ruiz-Medina et al.
16:15-16:30	**OP25**: Overview of more than twenty years of my geobotanical and geographical field research on Faial (Azores) - history, results and outlook. Christophe Neff
16:30-16:45	**OP26**: Impacts of volcanic eruptions on vegetation – Understanding the dominance of woody species and nitrogen fixers on oceanic islands. Carl Beierkuhnlein
16:45-17:00	**OP27**: First stages in intertidal algal colonization of Tajogaite lava deltas (La Palma, Canary Islands). Marta Sansón et al.

17:00-17:30	coffee break
17:30-19:00	**Poster session**

Wednesday, 14th September 2022	
9:00-14:30	**Excursion to Garajonay National Park** **Excursion to Valle Gran Rey coastline**

Thursday, 15th September 2022	
9:00-10:00	**Keynote: Current knowledge on Cabo Verde biodiversity: research lines and ongoing activities.** Maria Romeiras
	Session 6: Flora and vegetation - reproductive biology
10:00-10:15	**OP28**: Floral development and reproductive biology of three of Macaronesian and Mediterranean species with contrasting pollination systems: *Malva canariensis*, *M. wigandii* and *Navaea phoenicea* (Malvaceae). Javier Fuertes-Aguilar et al.
10:15-10:30	**OP29**: Breeding systems of Azorean endemic species: an overview. Guilherme Roxo et al.
10:30-10:45	**OP30**: Pollen-ovule ratios and breeding systems in Macaronesian taxa. Rosa Febles et al.
10:45-11:00	**OP31**: The gynodioecy - dioecy pathway from hermaphroditism in two Canarian endemisms, *Bosea yervamora* L. and *Rumex lunaria* L. Olga Fernández-Palacios et al.
11:00-11:30	coffee break
	Session 7: Flora and vegetation - taxonomic novelties
11:30-11:45	**OP32**: Increasing the knowledge of the Macaronesia mycoflora: new records of basidiomycetes from the Azores. Martín Souto et al.
11:45-12:00	**OP33**: New data on the *Exormotheca* (Exormothecaceae, Marchantiopsida) of Cape Verde. Insights from an integrative taxonomic study. Manuela Sim-Sim et al.
12:00-12:15	**OP34**: The complex evolutionary and taxonomic history of *Rubia* (Rubiaceae). Hanno Schaefer et al.
12:15-12:30	**OP35**: *Umbilicus* (Crassulaceae) of Macaronesia. Lucas Miller et al.
12:30-12:45	**OP36**: Comments on the Canarian flora and in particular on La Gomera. Arnoldo Santos
12:45-13:00	**OP37**: Flora and vegetation of El Hierro. Canary Islands. David Aeschimann
13:00-14:30	lunch break
14:30-15:30	**Keynote: Macaronesian seaweeds: an overview of species diversity, biogeography and evolution.** Christophe Vieira
	Session 8: Flora and vegetation - molecular evolution
15:30-15:45	**OP38**: Analysis of phylogeny and genetic diversity in *Micromeria* to determine the role of introgression and hybridization as base for adaptive evolution and ecological variability. Harald Meimberg et al.
15:45-16:00	**OP39**: Poales' phylogenetic structure across the Macaronesian Region. Vanézia Rocha et al.
16:00-16:15	**OP40**: Genomic changes in Macaronesian Malvaceae with contrasting pollination systems: *Malva canariensis* and *Navaea phoenicea*. Javier Fuertes-Aguilar et al.
16:15-17:00	**Poster session**
17:00-17:30	coffee break

17:30-18:15	**Poster session**
20:00	**Conference dinner**

	Friday, 16th September 2022
9:00-10:00	**Keynote: Anthropogenic impacts on intertidal communities of Macaronesian archipelagos.** Eva Cacabelos
	Session 9: Management and conservation
10:00-10:15	**OP41**: Assessing the environmental framework and dispersal ability of threatened Canarian endemic plants as a tool to improve their conservation status. Isabel Saro et al.
10:15-10:30	**OP42**: Preliminary quantification of the role of *Euphorbia balsamifera* dominated scrubland in the carbon stock of Tenerife, Canary Islands. Elena Rocafull et al.
10:30-10:45	**OP43**: INVASION project: towards an integrative approach for the study of plant invasion processes on the islands of Tenerife and Gran Canaria. Javier Morente-López et al.
10:45-11:00	**OP44**: Eradication treatments of an invasive species (*Ulex europaeus* L.) in Tenerife and their effect on local vegetation composition. Zaira Negrín-Pérez et al.
11:00-11:30	coffee break
11:30-12:30	**Keynote: Searching for keys of invasiveness on islands: a phylogenomic and functional approach in the family Asteraceae.** Yurena Arjona
	Session 10: Management and conservation
12:30-12:45	**OP45**: A worrying arrival: The first record of *Rugulopteryx okamurae* in Madeira Island and its invasive risk. Alejandro Bernal-Ibáñez et al.
12:45-13:00	**OP46**: Invasive species and their control at Garajonay National Park. Ángel Fernández et al.
13:00-13:15	**OP47**: RedEXOS, the early warning network of the Canary Islands for the detection and intervention of invasive alien species. Alicia Martín-Alonso et al.
13:15-14:30	lunch break
14:30-15:30	**Awards and closure**

PROGRAMME – Poster sessions

Monday, 12th September 2022 – Session: Plant ecology

P1 Modelling the potential distribution of alpine and pine forest species in La Palma and Tenerife in the context of climate change. Víctor Bello-Rodríguez et al.

P2 Road impact on plant species colonization in primary succession, Timanfaya National Park. María Bernardos et al.

P3 Comparing supervised classification methods to predict and identify forest vegetation-types of Western Iberia and Macaronesia. Jorge Capelo et al.

P4 Preliminary reconstruction of the Chibanian paleoenvironment in the north of Tenerife from phytoliths. José Ángel Afonso et al.

P5 Fire effects in bryophytes along an elevational gradient in the Canarian pine forest. Ruymán D. Cedrés-Perdomo et al.

P6 How do plants respond to fire in alpine ecosystems? Evaluation of the direct effects of fire in high mountain species of the Canary Islands. Yauci Espinosa-González et al.

P7 Volcanically baked killarney fern fossils (Hymenophyllaceae) from the Holocene of the Azores (Portugal). Carlos A. Góis-Marques et al.

P8 Assessing climate change vulnerability of restricted and widespread plant species on alpine habitats in two oceanic islands. Juana M. González-Mancebo et al.

P9 Project: A trident of invasive grasses (*Pennisetum-Melinis-Setaria*): colonization of the territory or distribution of the niche? Natalia Sierra et al.

P10 Effects of climate change on range size and functional traits of the Canary Islands' flora. Dagmar M. Hanz et al.

P11 Diversity of Desmidiales in freshwater systems of the Azores archipelago. Martín Souto et al.

P12 Intra-specific leaf functional traits on laurel forest tree species reveal different strategies of adaptation to climatic conditions. Jesús Parada-Díaz et al.

P13 Extremophile microalgae colonizing new lagoon habitats of the Tajogaite volcano deltas. Nereida Rancel-Rodríguez et al.

P14 Is the soil very dry and saline? It doesn't matter, I can reserve a lot of water. Marcos A. Ruiz-Medina et al.

P15 Unravelling the taphonomic signals of Pleistocene palaeoflora: first evidence of *Euphorbia* L. fossils from Tenerife (Canary Islands). María del Cristo Velasco-Flores et al.

Tuesday, 13th September 2022 - Flora and vegetation

P16 The contribution of the HMS Challenger to the mycota of the Canaries: the collections housed in the Royal Botanic Gardens, Kew. Begoña Aguirre-Hudson et al.

P17 Morphology and taxonomy of the Madeira Island (Portugal) endemic *Musschia aurea* (L. f.) Dumort. (Campanulaceae). Tiago Andrade et al.

P18 Reappraisal to the Madeira archipelago *Vicia* L. (subg. c*racca*, sect. c*racca*) taxa, based on molecular and morphological data. Célia Bairos et al.

P19 Results of the monitoring of the species *Camptoloma canariense* (Webb & Berthel.) Hilliard. Carlos G. Cáceres

P20 *Musschia wollastonii* Lowe (Campanulaceae) reproductive biology and pollinators of a Madeira Island (Portugal) endemic. Catarina Gomes et al.

P21 New records of native vascular plants from Cabo Verde Islands. Isildo Gomes et al.

AWARDS

ANA NETO AND DAVID BRAMWELL AWARDS

Early career researchers, including master and PhD students, and postdoc researchers with a maximum of three-year experience, attending to FloraMac 2022 will be eligible for the **Ana Neto and David Bramwell awards** for best presentations. These awards are dedicated to two great scientists who recently passed away who made a notable contribution to the knowledge of the rich flora and vegetation of Macaronesia.

Congress attendees will be able to vote for the best contributions presented as oral presentation and poster by early career researchers. One prize will be awarded in each of the following categories: oral presentation on marine flora, poster on marine flora, oral presentation on terrestrial flora, and poster on terrestrial flora.

Online/QR voting will be enabled during the sessions and eligible contributions would be indicated.

The most voted contributions will receive the Ana Neto (marine flora) and David Bramwell (terrestrial flora) awards.

VENUE / FIELD TRIPS INFORMATION

La Gomera island

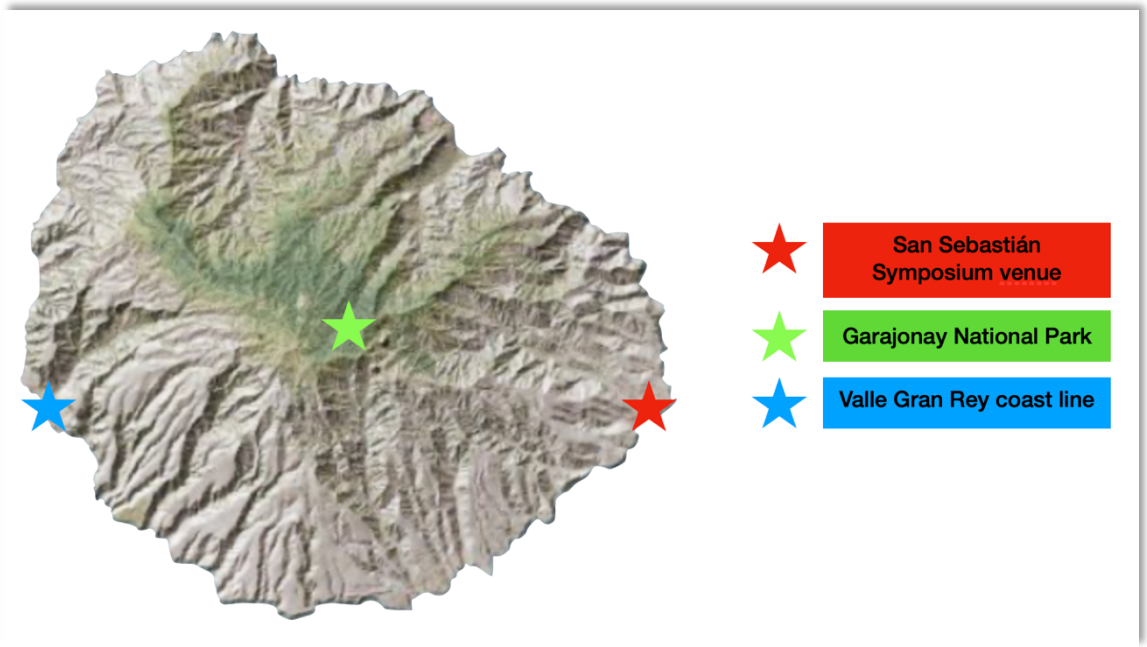
La Gomera is a small island located between the westernmost Canary Islands of La Palma and El Hierro and the central islands of Tenerife and Gran Canaria. It is about 11 million years old and has an area of ca. 400 km^2, with a current population of ca. 20,000 inhabitants.

Devoid of recent volcanic activity, the orography of La Gomera is very complex, with volcanic domes (Agando, Zarcita, Ojila, Cano, etc.), huge ravines and a central plateau from which a radial network of ravines crosses the entire island. The northern windward slope is steeper than the southern leeward slope. This complex orography has indirectly created the conditions for a very good state of conservation of its ecosystems and biota.

Although the island has few Canarian pine populations (Roques de Garabato and Imada), the present elevation of the island precludes the existence of a pine forest. Nonetheless, the plateau is occupied by a laurel forest in an exceptional conservation status, which constitutes the Garajonay National Park. Below the laurel forest, at both slopes, the best-preserved thermophilous woodlands of the archipelago can be found. Here the juniper (*Juniperus turbinata* ssp. *canariensis*) dominated vegetation (*sabinares*) rules, being especially noteworthy those of Vallehermoso and Tamargada. Besides those *sabinares*, La Gomera palm groves, characterized by the dominance of the endemic Canarian palm (*Phoenix canariensis*), splash all the ravines, forming a very singular landscape. Many of these palms have been sustainably exploited to produce palm sap (locally known as *guarapo*) and the product of its cooking, the splendid palm honey, constituting besides the *almogrote* and the Gomeran cookies, the biggest culinary treasure of the island. Beneath the thermophilous woodlands, very much expanded in the southern slope of the island, the coastal sub-desert scrub rules. The formation, of a clear African character, is dominated by several species of the genus *Euphorbia*, which in La Gomera reaches the highest biodiversity of the archipelago (*E. aphylla, E. berthelotii, E. bravoana, E. broussonetii, E. balsamifera, E. canariensis, E. lamarckii, E. lambii, E. mellifera, E. paralias, E. regis-jubae*). La Gomera counts with an exceptional flora, composed by ca. 40 insular endemisms of vascular plants, besides many more either Canarian or even Macaronesian endemisms (such as the laurel forest tree species). Among the more charismatic insular endemics outstands the arboreal sea lavender (*Limonium dendroides*), the very recently discovered *picopaloma* (*Lotus gomeritus*), two purges (locally known as *tabaibas*) (*Euphorbia bravoana* and *E. berthelotii*), the blue tajinaste (*Echium acanthocarpum*) and the mayflower (*Pericallis steetzii*).

Until now, studies on the marine flora of La Gomera have been very scarce. However, some localities, such as Los Órganos, represents a good example of the zonation pattern of the most wave-exposed coasts of the archipelago. The seagrass meadows of *Cymodocea nodosa* (*sebadales*) located in the most protected seabeds facing south have been documented as key marine habitats. However, unlike the rest of the islands, the macroalgae-dominated communities of La Gomera are still largely unknown. Small populations of the threatened brown algae *Gongolaria abies-marina* (*mujo amarillo*) can be seen in the north coasts, while the rest of the rocky bottoms are dominated by heterogeneous turfs, caespitose communities and urchin barrens (*blanquizales*).

From the political point of view, La Gomera is divided in six municipalities (Hermigua, Agulo, Vallehermoso, Valle Gran Rey, Alajeró and San Sebastián de La Gomera). San Sebastián is the main town, locally known as La Villa, where the Symposium venue is located (at the Cabildo Insular de La Gomera building, on the island Government facilities). Keynote and oral presentations will be held in the Auditorium, inside this building, while the poster sessions will be held in a next room. The city has several hotels and apartments to stay, and restaurants to eat, besides an excellent Parador Nacional located in a high place where the views of the capital are splendid.



Map of La Gomera. Location of San Sebastián, Garajonay National Park and Valle Gran Rey

Location of the harbor, symposium venue and Parador Nacional in San Sebastián

Garajonay National Park

The Garajonay National Park is a Spanish protected natural area that covers more than 10% of the surface of the island of La Gomera, one of the western Canary Islands. It was declared as such in 1981, being the fourth and currently the youngest national park in the Canary Islands. In 1986, UNESCO listed it as a World Heritage Site. The park is also a Biosphere Reserve since 2012 together with the entire island. It has 3984 hectares and occupy the central area of the island. The park is often enveloped in a humid fog, it is made up of basaltic materials, due to lava flows and pyroclasts, with various rocks and fortresses.

The park takes its name from the Alto de Garajonay, the highest point on the island at 1487 meters above sea level. The minimum height of the park is 650 meters, in the village of El Cedro. Its declaration is because it houses an excellent example of laurel forest, a humid forest of varied evergreen species that covered practically all of Europe in the Tertiary. This forest, which covers more than 85% of its surface, occurs in a uniform climatic regime in which the annual variation in temperature is small and precipitation is relatively abundant, with almost constant humidity due to the sea of clouds. About 50 tree species participate in its composition, distributing themselves and mixing according to their ecological affinities, to form several types of forests, the laurel forest and the *fayal-brezal*, a drier forest and poorer in tree species.

Valle Gran Rey coastline

Valle Gran Rey is a town located in the West coast of La Gomera, being the second most populated site after the island capital San Sebastián de La Gomera. Even so, Valle Gran Rey continues to be a quiet and welcoming place. This locality includes part of the natural protected areas of the island and integrates several sites of scientific interest. Although until the last century the inhabitants of the area were mainly dedicated to fishing and agriculture, in recent decades tourism has gained prominence.

It is a town that has very pleasant average temperatures, between 16ºC in winter and 26ºC in summer. From the highest areas of the valley to the sea, different levels of native vegetation can be seen, especially palm groves, but also terraces of abandoned crops and small groups of houses. On the coast, the mild environmental conditions allow bathing and practicing activities in the sea almost all year round, with Charco del Conde, Playa de Las Vueltas, La Calera and Playa del Inglés being interesting places. In addition, rocky platforms and tidal pools are also formed and constitute habitats for a particular marine flora and fauna. A tour of these intertidal environments or snorkeling or diving in this town allows you to discover part of the rich marine biodiversity of the Canary Islands.

ABSTRACTS

INAUGURAL CONFERENCE

Introduction to the flora and vegetation of La Gomera and its conservation

Ángel Fernández
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The presentation aims to describe the main features of the nature of the Island of La Gomera, focusing its attention on its flora and vegetation. La Gomera has a mountainous geomorphology, characterized by the absence of recent volcanism and the prominence of erosion, which has excavated its relief, creating very deep ravines, spectacular volcanic domes and cliffs. A great variation of environmental conditions is concentrated in its limited territory, from the warm and sub-desert environments of the coast to the temperate and cloudy environments of the summits, as well as the contrasts between the northern slope, favored by the humidity of the trade winds and the drier southern slope. This plurality of climates allows a contrasting staggering in vegetation belts, which include the halophilic coastal scrub, the sub-desert scrub of "tabaibas" and "cardones", the thermosclerofic forests of Mediterranean features and origin, the cloud forests of laurel forest and, in a very limited way, expressions of the Canarian pine forest. It also highlights the great richness of its endemic flora, which reaches the highest density of endemism in the European Union.
The transformation of the original ecosystems caused by human activity is explained, highlighting its impressive, terraced landscapes that climb its steep slopes, and that, currently, are mostly abandoned. The state of conservation of natural ecosystems are described, pointing up the existence of the most extensive manifestations of palm groves and juniper trees, as well as the best-preserved laurel forests of the Canary Islands. Briefly, the main current conservation problems are mentioned, highlighting the impact of forest fires, herbivory, the proliferation of invasive species and climate change. Finally, some ongoing conservation projects are mentioned, such as the restoration of the laurel forest, the management of threatened flora and the control of invasive species that are developed in Garajonay National Park.

KEYNOTE SPEAKERS

Coralline red algae of the Macaronesian region: uniqueness and biogeographical relationships

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Coralline red algae conform an extremely diverse group with a global distribution. They occur from the intertidal to the extreme limit of the photic zone and they are considered ecosystem engineers of high-diversity habitats such as the maerl (or rhodolith) beds. They are accommodated within the subclass Corallinophycidae which is currently composed of five orders of benthic red algae unique by the presence of calcite. While the order

Rhodogorgonales is a species-poor and mainly a tropical group of gelatinous algae with calcification limited to calcite husks, the remaining four orders -Sporolithales, Corallinapetrales, Hapalidiales and Corallinales, collectively known as coralline algae- are widely distributed, characterized by having calcified walls. Coralline algae show a high phenotypic plasticity that leads to both extreme variation within taxa and convergence between phylogenetically distant taxa. Since Philippi in 1837 recognized them as photosynthetic organisms, their taxonomy and systematics have been influenced by different methodological approaches. Thus, their high morphological variability together with the difficulty of the anatomical study of calcareous organisms led to the description of more than 1600 taxa (specific and infraspecific rank); however, uncertainty prevails, and many species remain unnamed or are putatively recognized as synonyms of previously described taxa. Such uncertainty is shown in re-assessments of coralline species diversity using molecular tools (e.g., DNA barcoding) in seemingly well-studied habitats (e.g. Mediterranean coralligenous, NE Atlantic maerl beds), where cryptic diversity has been detected in taxa that passed by under the same morphological species name. With regards to the coralline red algae in the Macaronesian region, the first records and descriptions of new species date back to the 19th century. During the 20th century further records and new species have described for the different archipelagos. As a result, an endemic component was recognized for the Macaronesian region, while other species recorded have a wider distribution characterized by European or tropical affinities. However, the current knowledge of Macaronesian coralline species diversity and biogeographic relationships are mainly based on morpho-anatomical evidence. According to the considerable cryptic diversity uncovered by molecular studies in apparently well-studied regions, the real number of coralline species in the Macaronesian region may be underestimated. Based on recent molecular studies conducted in the Macaronesian region and molecular information available from other regions, a preliminary analysis on the diversity and biogeographic components of the coralline algae in the Macaronesian region is presented and discussed.

Islands syndromes and Macaronesian plants

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An “island syndrome” can be defined as the set of traits that phylogenetically distant colonizers develop through convergent phenotypic responses to similar insular conditions. In this talk, we will examine some of the main hypotheses related to the evolution of plant traits in the context of the “island syndrome” (e.g., loss of dispersal ability or loss of defense on islands). We will also highlight the importance of implementing an evolutionary framework in studies taking advantage of mainland (Mediterranean)-island (Macaronesian) pairings to address evolutionary shifts in traits related to island syndromes. Lastly, we will review emerging patterns that can be inferred from empirical studies on this topic in Macaronesian plants. Our goal is to show that the Macaronesian islands provide a unique scenario to greatly improve our knowledge on island plant syndromes, since the biogeographical history of plant lineages and the environmental conditions in this area are quite different to those of the island systems where most of the empirical work on this topic has been carried out to date.

Predicting the distribution of macroalgae in a changing climate

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Predictions of species distribution are based on projections of the current niches to future climates. The most common method, namely Species Distribution Model (SDM), relies on projecting the realized niche of environmental tolerance in the field, measured by correlating distributional field records with the actual physical conditions. Although a powerful tool, SDM do not explores the mechanistic causes of species shifts, making difficult to predict outside the environmental gradient where the model was trained. In our ongoing research line, we are assessing the projections of SDMs using thermal thresholds suggested by mortality and growth experiments as proxies of the fundamental niches of physiological tolerance of foundation macroalgae: intertidal fucoids and subtidal kelps in current decline in response to coastal warming in southern Europe. A battery of ecophysiological experiments is being performed by combining physical stressors for testing additive and interactive effects and creating thermal gradients for detecting thresholds and trigger points. We integrated the knowledge by both approaches in a single hybrid modeling algorithm for detecting trends of decline that were omitted by SDMs. We present examples of how this integration of correlative and mechanistic approaches provides a better understanding of species distribution and more robust predictions of species distribution under climate change.

Run, forest, run! An ode to the importance of seed dispersal

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Most plants can only move during the short period that they are wrapped-up inside a seed, and the fate of these tiny life-vessels greatly determines the future of plant populations, forests, and ultimately of the entire biosphere. Many of these seeds are dispersed by frugivorous animals around the world, whose interactions can be captured and quantified in seed dispersal networks. In this talk I will present four complementary approaches that show how seed-dispersal networks can help us to understand the forces that have shaped the composition of present plant communities, how they function and how they are being affected and respond to ongoing biological and climatic global changes, with a clear emphasis on oceanic islands. First, we will explore if and how diaspore traits might affect long distance dispersal probabilities and thus the colonization of oceanic islands, including the Azores and Canaries. Secondly, we will tackle the question of how introduced animals have changed the seed dispersal networks of the island of São Tomé, and likely other islands around the world, potentially affecting the selective pressures that drive future vegetation dynamics on islands. Thirdly, we will analyze whether keystone seed dispersers also tend to play other preponderant functional roles in general community dynamics, thus unveiling the potential multidimensionality of keystone species. Fourthly, we will focus on how long-distance seed dispersal seem to be shaping the forests of the future by favoring the long-distance dispersal of early-fruiting species in the face of global change drivers. We will end with a call for the importance of long-term and broad-scale datasets on fruiting phenology to shed light over the effects of global change on global vegetation trends.

Current knowledge on Cabo Verde biodiversity: research lines and ongoing activities

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Cabo Verde is the southernmost archipelago of the Macaronesia. It is composed of 10 volcanic islands and several islets, located 1500 km southwest of the Canary Islands and ca. 570 km west of the African mainland. In terms of biogeography and ecology, Cabo Verde stands at a crossroads between sub-tropical Macaronesia and the dry Sahel region and is particularly vulnerable to climate change due to its small size, high susceptibility to natural hazards, and low economic resilience. All these shortcomings justify the need to implement strategies to conserve the fragile biodiversity of the archipelago. The main goal of this communication is to present recent advances achieved by the author and collaborators to update and complete the knowledge about Cabo Verdean plant diversity. This will include an overview of current knowledge, namely on endemic species diversity and their conservation status, the ecological and molecular characterization of the endemic flora, and the effects of climate change on future occurrence and distribution of native species in Cabo Verde. The socioeconomic importance of useful plants, particularly those native to the archipelago, will also be addressed. The new collaborative research developed by Portuguese and Cabo Verde Institutions in this framework will be described. The main results from a FCT/ AGAKAN (CVAgrobiodiversity) project will be highlighted; this is a multidisciplinary project covering different areas of expertise dealing with Biogeography, Phylogenetics, Genomics, Ecology, and Conservation. All these studies produced a significant amount of verified and organized information that has been made available through scientific publications and will soon be also compiled for wider audiences in the form of guides and red lists concerning the biodiversity of Cabo Verde. Finally, considerations will be made about the way in which knowledge produced during the last decade can be used in future initiatives and contribute to promote the conservation of plant diversity and sustainable management of Cabo Verdean natural resources.

Macaronesian seaweeds: an overview of species diversity, biogeography and evolution

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The marine macroalgal flora of Macaronesia has received a fair amount of attention, starting from the early 19th century, with an increase of interest since the 1980s. A synthetic overview of the current marine macroalgal species diversity, biogeography and evolution is presently provided. The Macaronesian region contains some 1053 macroalgal species, consisting of 641 spp. of Florideophyceae (61%), 243 spp. of Phaeophyceae (23%) and 169 spp. of Ulvophyceae (16%). The Canary Islands support the highest macroalgal species diversity, with 799 spp., followed by the Azores (431 spp.), Cabo Verde (426 spp.), Madeira (386 spp.), and the Salvage Islands (300 spp.); diversity numbers previously shown to be highly dependent on islands area, age and isolation. While these data, resulting chiefly from morphology-based taxonomic studies, may provide an accurate perspective on macroalgal species diversity across archipelagos and taxonomic classes, they may also be affected by research efforts still uneven across taxon and islands, and possibly

overlooking cryptic groups. Based on these data, the Macaronesian region shows biogeographic affinities with both sides of the Atlantic. Nevertheless, it presents a much closer affinity to the Caribbean region. Accordingly, Macaronesia occupies an intermediate position between the eastern and western Atlantic for the macroalgal flora; a hypothesis supported by a couple of recent molecular-based studies. Nevertheless, our current understanding of the Macaronesian macroalgal flora evolutionary history remains largely fragmentary and would necessitate molecular-based studies. Although so far not as striking as in other regions of the world, molecular-based taxonomic studies have allowed (1) confirming or rejecting the presence of some species (e.g., in the *Laurencia* complex), (2) finding new records and new species (e.g., in *Dictyota*, *Lobophora*), and (3) identifying phylogeographic patterns. Nevertheless, molecular-assisted taxonomic studies in Macaronesia remain quite limited and have focused on a few numbers of taxa (e.g., *Cladophoropsis*, Dictyotales, *Laurencia* complex) and localities. Multiplying molecular-based phylogenetic studies across taxa and islands/archipelagoes will be the future direction for Macaronesian phycological studies, which will allow refining our knowledge of macroalgal biodiversity, and elucidating the biogeographic and evolutionary history of the Macaronesian macroalgal flora.

Anthropogenic impacts on intertidal communities of Macaronesian archipelagos

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Habitat disturbance, biodiversity loss, resource overexploitation, climate change, contamination, and invasive species have been identified as key factors threatening ocean health worldwide. These pressures, derived from human activities, are also threatening Macaronesian waters. We will focus on understanding the effects of some of these anthropogenic impacts on the Azorean and Madeiran littoral communities to predict how they will influence their coastal biodiversity under future scenarios in these remote oceanic islands. Remote oceanic islands are highly susceptible to invasions due to the high availability of empty niches, low numbers of functional groups and lack of non-indigenous (NIS) predators, parasites, or competitors. Although research on NIS in Macaronesia has increased in recent years, e.g., the knowledge about NIS impacts, evidence on how invasions interfere with native communities and the mechanisms they use to invade is still limited. Understanding the biological and ecological factors responsible for a successful invasive process in these remote islands, the dynamics underlying biological invasions and the magnitude of stress a NIS may deliver to the local community represent necessary information for implementing efficient control, monitoring, and management programs. Another relevant factor affecting Macaronesian littoral ecosystems is coastal urbanization, whereby stretches of natural shoreline are modified or replaced by adding coastal defense structures. Coastal urbanization is associated with various negative impacts on the ecology

of coastal habitats via changes in important physical, chemical, and biological processes, which can strongly impact the structure and functioning of coastal ecosystems. Studies here will show how coastal defense structures could be modified, including adding simple topographic features such as pits, grooves, cracks, or water-retaining structures, to increase the biodiversity they support. Especially relevant ecosystems in these archipelagoes, also affected by coastal urbanization, are coastal marine forests, key species increasing the structural complexity and providing habitat and food for many associated species, and extremely threatened by different impacts of local and global origin, putting their stability and survival in question. Research developed will provide some inputs to build solutions and feed strategies for restoring marine ecosystems. This information is particularly relevant in the recently launched United Nations Decade of Ocean Science for Sustainable Development, Decade on Ocean Science for Sustainable Development, and Decade of Ecosystem Restoration.

Searching the keys of invasiveness on islands: a phylogenomic and functional approach in the family Asteraceae

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Invasive species are recognized as one of the key drivers of global biodiversity loss. Oceanic islands harbor a fragile and unique biota that make them especially vulnerable to invasive species. However, the factors behind the invasive success of certain species remain uncertain. Charles Darwin proposed two opposing hypotheses to predict the species invasive potential, known as the Darwin's Naturalization Conundrum (DNC). First, the "pre-adaptation hypothesis" proposes that species closely related to the native community have similar characteristics that make them pre-adapted to establish and spread under the same local environmental conditions. Alternatively, the "naturalization hypothesis" predicts that species distantly related to native species can exploit empty niches and avoid competitive exclusion, having a higher invasive potential. These two hypotheses, which rely on environmental and biotic filters respectively, can contribute to determine invasive success. In practice, the study of the DNC can be addressed by assessing two different dimensions of relatedness between species: phylogenetic and functional relatedness. In this talk we present the project ASTERALIEN that aims to test the DNC in the Compositae family, the most species-diverse plant family in the Canary Islands. From a phylogeny that includes all the genera and most of the species present in the archipelago, we estimated the phylogenetic relatedness between alien (invasive and non-invasive) and native species. In addition, functional traits were measured from all the species collected in the field and functional distances were calculated between alien and native species. Integrating both phylogenetic and functional approaches, it allows us to explicitly assess the invasive potential of alien species of the Compositae family under the framework of the DNC.

ORAL PRESENTATIONS

Session 1:
Island biogeography - colonization and diversification

OP1
Trait-dependent diversification and biogeography of Canary Island angiosperms: a community-wide approach

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Why have some island lineages radiated spectacularly, while others remained species-poor or did not radiate at all? Identifying the drivers that promote diversification is one of the key objectives in biodiversity research. Models have been developed to assess the effect of species traits on diversification, but these methods require densely sampled and well-resolved phylogenetic trees, which are not yet available for many insular groups. Using a sample of 840 species of Canary Islands flowering plants, comprising a large proportion of the entire native angiosperm flora of the archipelago (~61%), we will generate an angiosperm-wide time-calibrated molecular phylogeny using hybridization sequencing (hybrid capture-based target enrichment combined with next-generation sequencing). The phylogeny will include the island taxa and their closest relatives on the mainland, allowing us to gain an estimate of the times of colonization of Canary Island plant species. In addition, we will build trait databases on traits believed to influence diversification including growth form, fruit, and flower traits. The phylogenies and trait data will be used to test a novel multi-trait-dependent diversification model, specifically tailored for islands, that will be developed in close collaboration with this project. By combining the new model and the empirical data, we will identify plant traits that may have driven or hampered diversification, and triggered radiations in the Canary Islands.

OP2

No country for the ubiquitous: The origins and diversification of the Canarian endemic plants considered to be distributed in all islands

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Recent research shows that many Canarian plant radiations may have evolved from widely distributed ancestors, but it also emphasizes that the selective and stochastic landscapes of the islands trigger fast diversification, so that a widespread distribution should be an extremely transient condition in most taxa. As a result, endemics distributed in all islands of the archipelago (i.e., Ubiquitous Canarian Endemics, UCE) represent a rare component of the Canarian endemic flora (31 UCE, 4.6% of the currently recognized endemic flora). These elements are likely recent in origin, in many cases representing colonization events of the archipelago shortly before the late Pleistocene glaciations. We review the existing phylogenetic evidence for these taxa and compile data on their known distributions on each island to gain insight into their geographic origins and diversification. We show that the closest extant mainland congeners of the UCE often occur in distant mainland regions, thereby supporting the hypothesis of extinction of their closest relatives from Western Africa or close Mediterranean regions during the glacial cycles in the late Pleistocene. In some cases, however, the phylogenetically closest mainland relatives are also geographically near, indicating either (i) colonization from the mainland during or after the late-Pleistocene glaciations, or (ii) back-colonizations of the mainland from the islands. From a biogeographic perspective, the spatial analyses using the data layers in the NEXTGENDEM project (MAC2/4.6d/236) show that the UCE are (non-significantly) more widespread than the SIE on each island, but they concentrate in very different zones. Most UCE occur in lower regions with less complex relief, tentatively indicating that ecological processes are still an inconspicuous influence on their diversification. by contrast, the analyzed SIE tend to occur in the geographically highest and most complex regions, likely reflecting a major role of ecology, relief and stochasticity on their diversification.

OP3

Patterns of diversification and colonization in Macaronesian Apiaceae lineages: Ecological and cytogenomic approach

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The Macaronesian region comprises five archipelagos (i.e., Azores, Madeira, Selvagens, Canary Islands, and Cabo Verde) and harbors a rich endemic flora of approximately 900 vascular plant species. For this reason, it is considered a biodiversity hotspot and an ideal model to study evolutionary processes involved in flora diversification. The Apiaceae family includes cultivated taxa such as *Daucus carota* subsp. *sativus*. Seventy Apiaceae taxa occur in Macaronesia (including naturalized non-native taxa), of which 35 are archipelago-endemics. The Daucus complex (*Daucus–Melanoselinum–Monizia–Tornabenea*) represents a cladogenesis speciation model, whereas *Crithmum maritimum* (a monotypic genus) represents an anagenesis speciation model. This study aimed to investigate the cytogenomic patterns of two Apiaceae lineages with different speciation models, analyzing this along with ecological and morphological, and comparing it with mainland Portugal populations. The study of different species belonging to the Daucinae subtribe revealed that the taxon is a good predictor of genome size, however, only at a species level, as it is unable to clearly discriminate the *Daucus carota* subspecies. *Crithmum maritimum* presented a high cytogenomic variation despite belonging to a monotypic genus. Thus, to determine which environmental factors better explain this cytogenomic variation, we calculated different generalized linear models, revealing a tendency for an increase in genome size along the Portuguese coast, from south to north, in association with lower temperatures, higher precipitation, and lower precipitation seasonality. This gradient might result from historical phylogeographical events associated with previous dispersal and extinction of local populations. Results seem to support the tendency for smaller genomes to occur in islands.

OP4

Similar, yet different: contrasting macro and microevolutionary histories in the Canarian endemics *Kleinia neriifolia* and *Euphorbia balsamifera*

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Despite not being phylogenetically close, *Euphorbia balsamifera* (Euphorbiaceae) and *Kleinia neriifolia* (Asteraceae) are two species distributed in the Canaries that show convergent phylogeographic and ecological patterns. Both belong to plant lineages with a disjunct Rand Flora distribution (i.e., their closest extant relatives occur in eastern Africa), exhibit a succulent habit and similar climatic affinities, and coexist in xeric, coastal areas. Unlike most Canarian plants, these two species inhabit all seven major islands in the archipelago, so a comparative study may provide a better understanding of endemisation patterns and inter-island colonization within the Canarian Archipelago. Here, we reconstruct the colonization history of *K. neriifolia* and *E. balsamifera* using a comprehensive sampling across the archipelago (16 populations, c. 100 individuals) and combining target sequencing with genome skimming (Hyb-Seq) to extract information from 770 and 298 low-copy nuclear genes, respectively. In addition to the DNA sequences, we also recovered several thousands of SNPs from the targeted exon loci, which were used for population genetic analyses. Our results indicate a similar phylogeographic structure, with an east-west population division within the archipelago. However, other

aspects of their evolutionary history are different: intra-island genetic diversity was found to be greater on Lanzarote and Fuerteventura for *E. balsamifera*, and within Tenerife for *K. neriifolia*. Demographic analyses in *E. balsamifera* supports a pattern of recurrent back-colonization to the African continent, whereas divergence time estimates suggest that *K. neriifolia* has remained isolated from its closest extant relative (*K. anteuphorbium* from northwest Africa) for the last 2 million years, with no evidence of admixture. Using fresh and herbarium material, we also confirmed that the sister species of *E. balsamifera* is *E. adenensis*, an Eastern African-Southern Arabian endemic that is geographically isolated from *E. balsamifera* by thousands of kilometres of north African desert.

OP5

Inter-island colonization and evolutionary processes in the Canarian endemic genus *Parolinia* Webb (Brassicaceae): implications for conservation in a biodiversity hotspot

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The different ontogeny geological histories of the Canary Islands, which cover an age range between 0.5 (El Hierro) and 21 (Fuerteventura) million years, have drawn different patterns and processes of spatial colonization and diversification not only between islands, but also within islands. In addition, demographic events like migration, colonization, geographic isolation, genetic drift, hybridization, etc. that took place in the past determine the genetic relationships between the current species in a region. The Canary Islands, as an isolated oceanic archipelago, is a good framework to study these evolutionary processes, although the origin of its flora is still the subject of debate. While some authors argue that, most groups are monophyletic and multiple colonizations are prevented by competition with earlier colonizers (the 'niche preemption hypothesis'), the 'surfing syngamenon hypothesis' suggests that monophyly is artifactual, because high migration rates from the mainland to the archipelago and among the islands likely facilitated secondary contact among lineages previously isolated in the mainland, and the high genetic diversity generated by repeated hybridization among these colonizers would have favored both lineage diversification and the colonization of new areas. In this study, we use nuclear microsatellites on an exhaustive sampling of all the species of the endemic genus of the Canary Islands *Parolinia* in order to test both colonization hypotheses in this genus. Microsatellite data revealed a close relationship among *Parolinia* species and support the hypothesis of a recent evolutionary origin of these Canarian endemics. Bayesian analysis detected a geographical division between the western and the central islands, which may indicate different colonization processes followed by secondary contact within islands and inter-island colonization.

OP6

Evaluation of BEAST2 substitution rate-based calibration models as an alternative to the widely used fossil-based models in an automated pipeline to compute divergence times in the Macaronesian flora

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The NEXTGENDEM (MAC2/4.6d/236, https://www.nextgendem.eu/) project is generating multiple biotic and abiotic data layers associated with the Macaronesian endemic floras. To facilitate a universal accessibility to genetic data, a computational pipeline has been developed to perform automatic dating analysis relying on simple BEAST2 models that excluded the scarce fossil data in Macaronesia. The calibration of phylogenies based on universal substitution rates (RC) could be a feasible alternative to the widely used fossil-based calibrations (FC) to compute divergence times. We use the available molecular phylogenetic data for six Macaronesian plant lineages to carry out statistical analyses to compare RC and FC. Three competing RC and two FC strategies were evaluated according to the following criteria: 1) Marginal likelihoods to quantify their average fit to chloroplast and ITS molecular data; 2) Bayes Factors to quantify the statistical support against other models; and 3) distance metrics to measure disagreement among resulting species trees. Marginal likelihoods were computed using the Path-Sampling and multithreading Nested-Sampling methods. These strategies included both the Yule (RC-y and FC-y) or Birth-Death (RC-b and FC-b) tree models and the Relaxed clock model; except the very simple strategy (RC-s) containing the Strict clock and Yule tree models. Marginal likelihoods indicated that RC (RC-y or RC-b) fitted better to molecular data than FC in four lineages (*Sideritis*, *Descurainia*, *Ruta* and *Rhamnus*) and showed a better statistical support than FC according to Bayes Factors. FC showed a better fit in *Aeonium* and *Crambe*, although this support was not statistically significant compared to RC-y in *Aeonium*. The RC-s performed the worst in all settings. Distance metrics indicated that all models shared topology in a wide sense, whereas a higher similarity of branch lengths was found within RC or FC, respectively. RC consistently generated smaller divergence dates than FC, principally at the root and stem nodes.

Session 2:
Island biogeography - patterns and processes

OP7
Patterns and drivers of beta diversity across geographic scales and lineages in the Macaronesian flora

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The main aim was to assess whether beta diversity varies across taxa and archipelagos and identify the mechanisms behind beta diversity variation across taxa and archipelagos at different spatial scales by using Beta diversity and its two components. Species turnover and nestedness were compared within and among archipelagos across four taxonomic groups: liverwort, moss, pteridophyte and spermatophyte. The relationship between beta diversity and climatic, geological and geographic factors was analyzed using generalized dissimilarity models. Species turnover increased with scale. This increment decreased from spermatophytes, pteridophytes, and then mosses and liverworts. Species turnover was significantly higher in the Canary Islands than in Azores in pteridophytes and spermatophytes, but similar among archipelagos in mosses and liverworts. Mosses and liverworts exhibited a significantly higher nestedness than spermatophytes, and the reverse trend was observed for species turnover. Precipitation contributed more to the explained deviance of turnover in bryophytes and pteridophytes than in spermatophytes. Archipelago adscription significantly contributed to explain turnover in spermatophytes, but not in bryophytes and pteridophytes. Spermatophyte floras clustered by archipelago, whereas the clustering patterns in pteridophyte and bryophyte floras reflect macroclimatic conditions.
The lower increment of species turnover with spatial scale and the higher nestedness in bryophytes and pteridophytes than in spermatophytes reflect the variation in dispersal capacities and distributions ranges among land plant lineages. Accordingly, extant climatic conditions contributed more to explain turnover in bryophytes and pteridophytes than in spermatophytes, whereas factors associated with dispersal limitations exhibited the reverse trend. The differences in beta diversity patterns, caused by different responses of Macaronesian land plant lineages to the main factors shaping their community composition, explain their different biogeographic affinities, spermatophyte floras clustering by archipelago, whereas pteridophyte and bryophyte floras tend to cluster as a function of macroclimatic factors. These differences reflect distinct mechanisms of origin and diversification among Macaronesian land plant lineages and archipelagos.

OP8
The evolution of insular woodiness

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Insular woodiness - the evolutionary transition from herbaceousness towards woodiness on islands - is one of the most iconic features of island floras. Since pioneering work by Darwin and Wallace, a number of drivers of insular woodiness have been proposed: (1) competition for sunlight requiring plants with taller and stronger woody stems, and (2) drought favoring woodiness to safeguard root-to-shoot water transport. Alternatively, insular woodiness may be the indirect result of increased lifespan related to (3) favorable aseasonal climate, and/or (4) lack of large native herbivores. However, information on the

occurrence of IW is fragmented, hampering tests of these potential drivers. Here, we identify 1,097 insular woody species on 375 islands, and infer at least 175 evolutionary transitions on 31 archipelagos, concentrated in six angiosperm families. Structural equation models reveal that the insular woody species richness on oceanic islands correlates with favorable aseasonal climate, followed by increased drought and island isolation (approximating competition). When continental islands are also included, reduced herbivory pressure by large native mammals, increased drought and island isolation are most relevant. Our results illustrate different trajectories leading to rampant convergent evolution towards insular woodiness, and further emphasize archipelagos as natural laboratories of evolution, where similar (a)biotic conditions replicated evolution of similar traits.

OP9
Island disharmony of the bryophytes community of Macaronesia

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Island disharmony reflects the biased community composition of island biota as compared to continental sources owing to filtering effects (dispersal, adaptation, biotic interactions) followed by in-situ diversification. Bryophytes exhibit efficient long distance dispersal capacities, 'all-purpose' genotypes, low levels of endemism and limited biotic interactions. Their community structure and composition are therefore expected to display little differences with continental sources. To test this hypothesis, we first identify, based on analyses of floristic similarities, phylogeographic analyses of non-endemic species, and phylogenies of endemic species, which continental floras are and have been the most likely sources for the Macaronesian flora. We then quantify the disharmony of the Macaronesian flora by a comparative analysis of the life-history traits between the Macaronesian archipelagos and continental sources.

OP10
Diversity of useful plants in Cabo Verde islands: a biogeographic and conservation perspective

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The terrestrial flora of Cabo Verde, including cultivated species, includes about 891 species, distributed in 515 genera, 151 families and 73 orders, distributed in Bryophytes (17%), Pteridophytes (4%) and Spermatophytes (79%). About 12% of the identified species are endemic to the archipelago. This biodiversity is threatened by activities that meet human needs. To counter this act, recorded in this archipelago for centuries, an

integration of scientific and local knowledge is required, but no comprehensive list of the useful plants is available. Many species have been introduced since the 15th century to support colonization and commercial interests. The main goal of this communication is to evaluate: 1) the floristic diversity and its phytogeography; 2) the role of geophysical, historic, and socio-economic factors in the distribution and use of these species; 3) species potentially relevant to sustainable development. Data were obtained from floras, scientific publications, historical documents, herbarium specimens and field work. We identified 518 useful taxa, of which 145 are natives, 38 of them endemic, 373 introduced and 44 endangered. The number of useful taxa is correlated with altitude and agricultural areas, as well as with rural population indicators, but not with socio-economic indicators such as total population or gross domestic product. Native species are mainly used for wood, firewood, fodder, and other purposes. The data and information collected indicate that agrobiodiversity and traditional practices seem crucial to cope with recurrent droughts and ensuring food security. They also indicate that overuse of some native taxa has caused, and continues to cause, significant impacts on their conservation that must be minimized. The sustainable management of populations of native species can contribute not only to the food security of local communities, but also to the sustainable growth of the local economy.

OP11

Biogeographic origins and drivers of alien plant invasions in an oceanic archipelago

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Understanding the historical and contemporaneous determinants of invasion success in island systems can help to decisively contribute to identifying sources and designing strategies against the scenarios that are more likely to give rise to new invaders. Herein, we investigate the origins of the invasive alien flora of the Canary Islands, with emphasis on the mechanisms shaping its spatial organization within the archipelago. An updated checklist of the invasive alien flora of the Canary Islands was compiled together with key complementary information, including native biogeographical regions, stage of invasiveness, and dates of naturalization. Our updated list includes 149 alien plant species with a certain degree of invasiveness. The Neotropics stood out as the region providing the highest number of invasive species, followed by the Cape Region, tropical Africa, and the Mediterranean Basin. We observed a slow but steady increase in numbers of invasive species until the 1950s, followed by a stronger rise thereafter. Among various possible mechanisms, we reveal that climatic similarity seems to best explain patterns of composition dissimilarity within the invasive flora among islands. Interestingly, the Neotropical region stands out as the main source of plant invasions to the Canary Islands, outnumbering those from other regions with a Mediterranean-type bioclimate, emphasizing the importance of historical trade networks. Our study brings attention to the importance of archipelago dependent assessments of the underlying mechanisms that contribute to plant invasion success in oceanic archipelagoes.

OP12

Source areas and dispersal patterns within the Macaronesian flora

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This study of the spermatophyte flora of Macaronesia examines several non-exclusive hypotheses about colonization to and dispersal within this insular oceanic region: 1) Classic model: archipelagos closer to source areas were colonized first and more often; 2) Progression rule model: older archipelagos were colonized first and younger archipelagos later, via stepping-stone dispersal; 3) Habitat filter model: source areas reflect the habitats available within a given archipelago. Abundant phylogenetic studies allow us to identify the source regions for Macaronesian taxa. For native non-endemic (NNE) species, we use the non-Macaronesian distribution to estimate where the taxon likely originated. For larger clades, there is sufficient topological evidence to determine the number and direction of dispersal events among the four major archipelagos. Different source areas are overrepresented in the four archipelagos: North Temperate Europe in the Azores, the Mediterranean region in Madeira and the Canaries, and Tropical Africa in Cape Verde. Nonetheless, the Canaries exhibit the greatest diversity of source areas, reflecting their greater habitat diversity. Most large endemic lineages (radiations) extend across multiple archipelagos, having formed in one and dispersed to others; the most common patterns of dispersal are from the Canaries to Madeira (sometimes then to the Azores) and from the Canaries to Cape Verde. Overall, dispersal patterns are a function of archipelago age progression, habitat filters, and in situ diversification. The habitat diversity and age of the Canary Islands in particular appear to have promoted diversification (with associated habitat shifts) of several key clades, facilitating colonization of archipelagos with habitats substantially dissimilar to source areas.

Session 3:
Plant ecology - community dynamics

OP13

Soil properties, but not biodiversity facets, mediate productivity in the Canary Islands and mainland Spain

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The last decades have seen a growing concern about the consequences of biodiversity loss for the provisioning of ecosystem services for human well-being. Hundreds of biodiversity-ecosystem functioning (BEF) studies have shown how biodiversity promotes ecosystem functioning. Whether this also applies to biodiversity facets on highly threatened biodiversity hotspots such as oceanic island ecosystems remain unclear. Here, we examined the relationship between taxonomic, phylogenetic, and functional diversity with primary productivity on forest ecosystems across the Canary Islands and compare it to climatically similar areas in mainland Spain. To test the multifaceted BEF relationship between an oceanic archipelago and a mainland area with similar climatic conditions, we used forest plot data and calculated multifaceted diversity metrics and the biomass increment, as proxy for productivity. Using linear models, we assessed the influence of biodiversity facets on productivity, while accounting for variation in environmental heterogeneity and spatial autocorrelation. We found that soil nitrogen was the only abiotic variable that had differential effects on islands and the mainland, while taxonomic diversity was the only facet that consistently predicted productivity. Our findings highlight the importance of preventing species loss, as well as forest degradation, in order to maintain ecosystem functioning and the delivery of ecosystem services.

OP14

Differences in soil bacterial and fungal community structure between natural, production forest and exotic woodland, as revealed by metabarcoding in an Atlantic Island

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Forests are key to the global ecosystem as they provide several ecosystem services such as protecting biodiversity, preserving soils, acting as carbon sinks, and providing wood resources. The undisturbed nature of forests soils allows for the development of clear soil horizons, creating in the process large and dynamic microbial habitats, influenced by the tree species present. These microorganisms in turn play an essential role in nutrient cycling, tree nutrition and health, with mycorrhizal fungi and nitrogen-fixing bacteria being responsible for a large percentage of the nitrogen and phosphorus acquired by trees. São Miguel is an ideal place to model changes in these communities with natural (e.g., Laurel forests) and artificial (e.g., *Cryptomeria japonica* production forests) habitats in close proximity. Two forests and one woodland were sampled in São Miguel: natural forests, exotic woodlands, and production forests (n=9). Soil DNA was extracted and sequenced by Illumina Miseq, followed by the assembly of operational taxonomic units (OTUs) from fungal and bacterial community marker genes. Numerical ecology, maximum likelihood and Bayesian statistical methods were conducted in R. Significant differences were seen in the richness and structure of bacterial communities between exotic and the two forests, with the latter two being somewhat similar. While fungal communities' richness was not significantly different, distinct indicator OTUs were found, with exotic woodlands showing, once again, a very distinct fungal community structure when compared with the two forests. Environmental and soil factors, such as altitude, precipitation, temperature, and silt content also separate exotic woodlands from the forests. We can conclude that in

addition to the sharp difference between plant communities, soil, and environmental factors, woodlands lead to a reduction in soil bacterial richness and a significant shift in soil bacterial and fungal community structure.

OP15

Summit vegetation responses to cultural landscape transformations in the Teide National Park, Tenerife, Canary Islands

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Oceanic volcanic islands typically exhibit stark changes in altitude within reduced territories, creating some of the most heterogeneous and biodiverse territories on earth. Volcanic summits can reach several thousand meters, being inhabited by species adapted to high-altitude conditions where the potential for further altitudinal migration is limited. Studying the composition and temporal variability of these vulnerable ecosystems can yield important insights for the conservation of endangered species. Here we apply multiple paleoenvironmental analyses to a sedimentary sequence from the Arenas Negras basin, in the Teide Caldera, Tenerife, reconstructing vegetation responses to volcanic activity and cultural practices since c. 2500 cal yr BP. The integration of sedimentology, pollen, charcoal, phytolith and diatom analyses allows the detection of changes in soil conditions and characterises past vegetation through different fire and herbivory regimes. We report a different composition of summit vegetation in pre-human times, including high percentages of pollen from *Pinus* and *Juniperus*, which decreased after the eruption of Montaña Blanca c. 2500 cal yr BP. In prehistoric times, herbivore grazing, and local fires drove scrubland vegetation change, producing dynamic processes of succession due to species competition within a degraded landscape. Diatom and phytolith analyses show how seasonal ponds underwent eutrophication linked to intense grazing. The introduction of new herbivores (e.g., rabbits) and the continued land use during the historical period drove the decrease of Fabaceae and Brassicaceae shrubs until the declaration of the Teide National Park.

OP16

Phytoliths in modern plants from the Canary Islands as a reference for the reconstruction of long-term vegetation change and culture-environment interactions

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The Canary Islands is the only Macaronesian archipelago to have been settled by humans since prehistory. The various ways in which Indigenous inhabitants and posterior European

colonisers interacted with native and endemic flora remains a central topic for archaeologists, geographers, and ecologists. Phytoliths are botanical silica structures with high potential of preservation in sediment deposits and can help reconstruct ancient lifeways and vegetation change through time. However, a comprehensive and systematic study and reference collection of phytolith production by Canarian plant species is lacking. To create a first reference collection of phytoliths of species native and endemic to the Canary Islands, we processed over hundred plant specimens collected in Tenerife, Gran Canaria and La Palma islands using dry ashing method, recorded phytolith morphologies, and carried out morphotype quantifications. We categorise taxa, as producers of diagnostic phytoliths, producers of undiagnostic phytoliths, and non-producers. Our results suggest that species within the Arecaceae, Boraginaceae, Cyperaceae, Poaceae and Urticaceae families are the main native producers of phytoliths in the archipelago. However, we also identify phytoliths with diagnostic potential in particular species within the Apiaceae, Asteraceae, Cistaceae, Brassicaceae, Euphorbiaceae, Lamiaceae, Lauraceae, Ranunculaceae and Rubiaceae families. We use ordination analyses to show how phytolith assemblages could differ among Canarian ecosystems, and how they might be represented in archaeological sites and sediment records. Our growing reference collection is a significant step forward towards the application of phytolith analysis to disentangle long-term climatic and human-driven transformation of this biodiversity hotspot.

Session 4:
Plant ecology - the impact of climate change

OP17
Quantitative wood anatomy of eight dominant tree species from Macaronesian laurel forests

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Determining the response capacity of forests to climate change is one of the most important current environmental concerns. The study of quantitative wood anatomy allows to estimate the hydraulic functioning of plants and gives important information about how different species can adjust to potential shifts in environmental conditions. This knowledge is essential in ecosystems that are sensitive to drought and rising temperatures, such as Macaronesian laurel forests. We expect that laurel forest trees, despite belonging to different species, present (1) common features in their wood anatomy as a consequence of evolutionary convergence; (2) intra-specific variations in their wood traits depending on the environment in which they inhabit; and (3) a xylem configuration that is hydraulically efficient but minimizes the risk of cavitation under dry conditions. The aim of this study was to describe the anatomy of eight dominant tree species from Macaronesian laurel

forests. Four of them (*Laurus novocanariensis*, *Persea indica*, *Ilex perado* subsp. *platyphylla* and *Morella faya*) were sampled at two different sites, whereas *L. azorica* and *Picconia azorica* were sampled only in the Azores, *P. excelsa* only in the Canary Islands and *Clethra arborea* only in Madeira. We collected wood increment cores from five individuals per species and site and obtained transversal microsections of 10 µm thickness stained with Alcian blue and safranin. Then, we digitized these microsections and quantified tree vessel lumen diameter, vessel density, vessel grouping and vessel arrangement, and estimated their potential hydraulic conductivity. This knowledge of quantitative wood anatomy will inform us about which wood anatomical traits have taxonomic importance. Moreover, it will allow to detect differences in sensitiveness to climate variability among coexisting tree species, reporting on which species should be the focus of management and conservation efforts.

OP18

Taxonomic, functional and phylogenetic diversity of bryophytes along an elevation gradient across an oceanic island (Madeira)

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Oceanic islands are of crucial importance for the conservation of biodiversity. Of the 34 biodiversity hotspots identified by Conservation International in 2005, 12 are or include island ecosystems. Bryophytes (liverworts, mosses, and hornworts), the earlier group of land plants, harbours a high diversity, especially in the northern Macaronesian archipelagos (Azores, Canaries, Madeira), where they play a vital role in ecosystem functioning. Bryophytes can be found from sea level to above the tree line, where they grow on soil, rocks, and the bark of trees. Most species develop special ecological, morphological and physiological adaptations to survive and grow under special habitat conditions, which makes them excellent candidates for elevational studies, considering the three levels of diversity (taxonomic (TD), functional (FD) and phylogenetic (FP)). In this study we aim: i) to compare taxonomic, functional, and phylogenetic diversity of bryophytes along an elevational gradient on Madeira Island; and ii) identify the drivers of three dimensions of biodiversity in order to contribute to conservation programs. Bryophytes were sampled between 2014 and 2018, along the elevation gradient (from 100 m a.s.l to1800 m a.s.l). In total, 70 plots were surveyed, collecting in a total 183 bryophyte species. Preliminary results suggest that the three levels of diversity (TD, FD and PD) are highly correlated along the studied elevation gradient. The conservation programs should consider not only species richness but also functional and phylogenetic diversity. This study is pioneer in considering the three levels of bryophyte diversity along an altitudinal gradient in oceanic islands (with Madeira as a model) in order to contribute to management and conservation of natural resources.

OP19

Climate change impact in laurel forests at Garajonay National Park

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Garajonay National Park is well known because of the laurel forest, a unique ecosystem that demands high humidity and mild temperatures. Potential distribution of this very special ecosystem is associated with the presence of frequent fogs in the western Canary Islands. The values of the environmental parameters conditioning the growth of laurel forests, especially precipitation, are reaching critical minimum or extreme levels. There is a clear reduction of normal rainfall in the last three decades. Same happens with forest throughfall, with some remarkable exceptions, like the ridge areas of the Park, where it has hugely increased. Though we have no clear evidence of temperature rise at the Park, a worrying decrease of permanent streams water flow has been detected. Severe impacts in some forest areas are especially visible during the dry season, when vegetation show clear signs of crown defoliation, leaf damage and desiccation. Forest dieback is also a real issue in extensive areas and take place in different ways, depending on topography, forest maturity, soils and other factors. There is not a clear explanation for this dieback, but climate change will aggravate, with no doubt, this phenomenon. All of this will increase the vulnerability of these forests to wildfires. This risk is exponentially multiplied with the abandonment of traditional uses of the land of the human populations surrounding the Park. This facilitates the expansion of young forests and the increase of shrub cover, both of them highly flammable, in the outskirts of the mature laurel forests. There is also a rise in the number of fires provoked by humans, as a consequence of the loss of the previous existing links with their ancestral land. This set of factors will induce a growing exposition of laurel forests to the danger of great catastrophic wildfires.

OP20

Vulnerability of cloud forests to climate change: what can we learn from high-resolution climatologies in a topographically complex oceanic archipelago?

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Cloud forests, ecosystems experiencing from persistent to frequent low-level cloud cover, exhibit extremely high levels of biodiversity with large percentages of endemism. On islands, cloud forests are often relatively small, isolated patches, which make them sensitive to climate change. To improve our understanding of cloud forest response to global warming, we developed CanClim, a high spatial resolution climate model of the Canary Islands. In particular, by downscaling the 30-arc-second resolution climate model

of Chelsa project and generating an ensemble of past (Last Glacial Maximum; LGM), present (1979-2013) and future (2071-2100; from the Coupled Model Intercomparison Project-6) climate models at 100m resolution for the Canary Islands, we aimed at unveiling the potential geographic distribution of the Canarian cloud forest from the LGM to 2100. We used species distribution models (SDMs), which offer us the potential to forecast past, present, and future potential distributional ranges for all of the species having a number of occurrences >= 40 which corresponds to 576 species in total from the cloud forest community. Cloud forest species will slightly lose on average (21 to 45% of their current suitable area, depending on the future climatic scenario) more than gain suitable areas (16-41%) in 2100 whereas, during the LGM, 80% of their current suitable area was on average unsuitable. To maintain their climatic area on the elevation gradient, species will have to move upward between 99 to 221 m on average in the future while during the LGM, the species mean elevation was on average 342 m below. When comparing these two elevations shifts in function of the time difference with current time, these results showed that Canarian cloud forest has never face these shifts in such a short time period, questioning if species will be able or not to track their future suitable areas.

OP21

The geographic context rules the miniaturization and shift of *Gongolaria abies-marina* forests: fifty years of data reveal drastic changes in the organization of benthic communities

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Marine forests are declining worldwide due to Climate Change, grazing and other local anthropogenic disturbances, as a result macroalgae communities are strongly changing. Most common shifts described are transitions from perennial large-macrophytes to turfs or barrens, but they are not the only one. Here we reconstruct 50 years of changes in the forests of *Gongolaria abies-marina*, a fucalean species from the Northeast Atlantic, in the Canary archipelago. Historically, these forests have declined in extent and lushness and cover, and the thallus length of this species have reduced to the minimum. *Gongolaria abies-marina* has been replaced by other perennial and native macrophytes: fleshy algae (*Lobophora, Dictyota, Canistrocarpus, Halopteris*), crustose algae (coralline algae), and other large brown algae (*Ericaria*). The changes have been influenced by the geographical context, and as a result the communities that have replaced *G. abies-marina* differ between islands following the east-west oceanographic gradient of the archipelago. Most of the new communities are dominated by shorter or smaller macroalgae, this together with the reduction in the size of *G. abies-marina*, this has caused a miniaturization of the subtidal vegetation. Contemporary data indicate that the regression of *G. abies-marina* continues, although in some places the forests have not experienced such a drastic regression.

Session 5:
Plant ecology - ecological succession and the associated mechanisms of adaptation

OP22

The fate of vegetation during an oceanic island volcanic eruption (Tajogaite volcano, La Palma Island)

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From September 19 to December 13, 2021, a volcanic eruption occurred in La Palma Island ("Hoya de Tajogaite", Cumbre Vieja ridge). The 85 days of eruption built an edifice 34 Mm^3 in volume and ~200 m high producing ~180 Mm^3 of lava flows covering 1241 ha. Nearly the whole island was affected by ash during the eruption, accumulating > 1.5 m in the proximity of the cone. This framework was an excellent opportunity to study how the eruption influences the vegetation during the different phases. The main aim of this work comprised spatial and temporal assessments of plant species vitality and cover. 50 plant species were affected (25 endemic to the Canary Islands). Of the area covered by lava flows, 165 ha (13%) were classifiable as pine forest, 826 ha (67%) as thermophilous shrubland and 250 ha (20%) to xerophytic scrub. A vast surface area of the pine forest, the ecosystem where the volcano arose, was affected by volcanic ashfall, sulfuric acid aerosols, and short episodes of acid rain. However, this conifer has shown high resistance to temperature, confirming its great adaptation to volcanic events. The intense volcanic ash fallout mainly affected areas within the 2.5 km perimeter closest to the crater, including pine forest and thermophilous shrubland. The lava flows covered a large part of the thermophilous and xerophytic ecosystems. The life cycle of flowering plants was drastically disrupted due to all the above factors, with great impact on the foliage, photosynthesis and growth. However, woodiness favors the resistance of many plants to high temperatures close to craters and lava flows but primarily their resistance to the intense ashfalls. Although it is challenging to assess whether volcanism can drive evolutionary traits of insular organisms, our data suggest that such evolutionary changes have favored their resilience during the eruption.

OP23

First stages in shallow subtidal algal colonization of Tajogaite lava deltas (La Palma, Canary Islands)

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On September 19, 2021, a volcanic eruption started on La Palma Island, ceasing on December 13. During the almost three months that the eruption lasted, several lava flows

reached the coastline, creating two new independent rocky platforms on the western coast of the island. The new submarine lava flows have drastically changed the previous landscape from a highly dynamic sedimentary seafloor to a solid, highly heterogeneous basaltic rock substrate. This new environment sets the perfect scene to study the colonization process in a marine environment. Here, we report the first results of a long-term monitoring of the marine algal community, comprising the first three sampling campaigns (February, April, and July) of the study. Samplings were performed on three experimental locations on the southernmost lava delta, and three control locations further south at La Bombilla. Results show a rapid colonization of the new substrate by filamentous algae and coralline crusts, with the occasional presence of more complex macrophytes that are becoming more abundant as the months pass.

OP24

Changes in antioxidant activity of fresh marine macroalgae from the Canary Islands during air-drying process

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Marine macroalgae develop structurally distinct molecules that have been long recognized as an important source of natural products, e.g., bioactive compounds and antioxidants, such as carotenoids, amino acids, proteins, lipids, vitamins and polyphenols, with promising properties as anticoagulant, anti-proliferative and antimicrobial. In this study we analysed the antioxidant activity of 24 fresh methanolic extracts from marine macroalgae from the Canary Islands. Additionally, the effects of the air-drying process in the antioxidant activity were also evaluated. Plant material was collected in three locations on the island of Tenerife. Total antioxidant activity methods included DPPH-free radical scavenging activity and ferrous iron chelating activity. Phytoconstituents evaluated were total carotenoids, proline, phenols, flavonoids and condensed tannins content. Our results indicated that from fresh material, species *Cladophora liebetruthii*, *Dasycladus vermicularis* and *Dictyopteris polypodioides* presented the highest scavenging activity, supported by high correlation with phenolics and flavonoids content, however, in air-dry extracts, *Anadyomene saldanhae* and *D. polypodioides* showed the highest antioxidant potential, correlated with a high phenolic compounds content. *Asteronema breviarticulatum* and *D. polypodioides* presented a high content of carotenoids in fresh and air-dry state. The highest ferrous iron chelating activity (> 60%) was recorded in extracts from fresh material in *Grateloupia imbricata* and *Lophocladia trichoclados*. However, only *L. trichoclados* was able to maintain this high activity after air-drying supported by a high proline content. *A. breviarticulatum* was the species that showed the highest condensed tannins content both in fresh and dried extracts. The study revealed that fresh extracts of *D. vermicularis, D. polypodioides* and *L. trichoclados* possess promising properties as raw materials to obtain biologically active substances in the alimentary and pharmaceutical industry. Besides, these properties were maintained after the air-drying period in the last two species, which makes them species of great interest to be used under drying preservation methods.

OP25
Overview of more than twenty years of my geobotanical and geographical field research on Faial (Azores) - history, results and outlook

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The history of more than twenty years of my geobotanical and geographical field research in Faial Island (Azores) will be presented. The research on the island is geographically divided in two research areas: the Capelo region (Capelo-ash fields and the Capelinhos Volcano) and the vegetation of human settlements (gardens and parks in Horta and other localities). Thematically, most research in the Capelo area is focused on the dynamics of pioneer vegetation after the eruption of Capelinhos in 1957/58. Such research could be categorized as traditional succession study. The research in regard to the vegetation of human settlements has more ethnobotanical inclination. The dynamics of pioneer vegetation on the Capelinhos volcano is still dominated by alien species. Specifically, there are still no trees and bushes on the Capelinhos. This trend is confirmed by the results of our field campaigns in September 2019 and September 2022. As well as on other volcanic islands the avifauna seems to be an important driver of the vegetation dynamic on the Capelinhos. The vegetation dynamics of the ash fields of Capelo is still partly dominated or even blocked by *Arundo donax* as described by the author in 2021. But the vegetation dynamics is increasingly disturbed by human intervention. For example, viticulture is experiencing a rebirth. In fact, this re-birth has been accompanied by the construction of several houses and vacation homes which has consumed most “natural” landscapes of Portugal. In most of the cases these secondary residences are owned by citizens from France, Switzerland, Germany and the United States of America (Field studies September 2021). Species composition of traditional parks and gardens in Horta and surrounding localities will be presented. Furthermore, the link of the “garden and parks” vegetation to the successional processes in the Capelo area will be presented and discussed.

OP26
Impacts of volcanic eruptions on vegetation – Understanding the dominance of woody species and nitrogen fixers on oceanic islands

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The recent eruption of La Palma enabled to investigate the effects of volcanic eruption on vegetation. Besides the destructive power of the lava flow, it was the emission of sulfuric gases and of huge amounts of pyroclastic ashes that could be recorded. The responses in vegetation structures and plant species were impressive. The damage of gases on plant tissue and the deposition of tephra had substantial and large-scale effects. Such events are frequent at geological and evolutionary times scales. However, they can rarely be observed within human time scales. The drastic chlorotic damage to plant tissue caused a total defoliation of plant specimen (e.g., *Pinus canariensis*) within a radius of a few kilometres. This response could be detected even by remote sensing. Nonetheless, the impact of toxic gases was found to be transient. Canary pine and other endemic woody species were found to resprout within a few months after the end of the eruption. This response was similar to the resprouting after wildfires. In contrast, the deposition of ashes accumulated to thick layers of tephra (lapilli etc.) and did not allow small or short-lived herbs and grasses to

recover. This impact selected for woody species, which might even have lost their foliage due to sulfuric gases. Nevertheless, such plant species populations survived even the deposition of more than 1m of ashes in the vicinity of the craters. Additionally, we found that legume species became also abundant after the end of the eruption, particularly on shallow layers of ash and/or if vital seed source were still existing nearby. This response also resembled to the emergence of legumes after forest fires, when nutrients from leaves are mineralized but nitrogen is lacking. Both types of responses may contribute to the understanding of island woodiness and of the dominance of nitrogen fixing species on volcanic islands.

OP27
First stages in intertidal algal colonization of Tajogaite lava deltas (La Palma, Canary Islands)

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Nine days after the start of the eruption of the Tajogaite volcano (September 19-December 13, 2021), the lava reached the west coast of La Palma four times, finally forming two lava deltas of different ages and sizes. The northernmost delta is the youngest and occupies about 5 hectares, while the one located to the south was formed from the arrival of the first three flows and has an area of about 44 hectares. The new coastland consists of beaches of pyroclasts that alternate with low cliffs and rocky platforms that penetrate the seabed to depths of more than 50 m. During three sampling campaigns (February, April, and July 2022), the first stages of colonization of lava deltas by intertidal macroalgae were studied at one station in the northern delta and two stations in the southern delta and compared with three control stations located to the south. Results show a rapid settlement by primo-colonizing species (Bangiales, Ulvales, Ectocarpales, Corallinales) in these new substrates, with 100% coverage already two months after the end of the eruption, and the beginning of the succession, with spatial and temporal differences between the localities studied.

Session 6:
Flora and vegetation - reproductive biology

OP28
Floral development and reproductive biology of three of Macaronesian and Mediterranean species with contrasting pollination systems: *Malva canariensis*, *M. wigandii* and *Navaea phoenicea* (Malvaceae)

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As part of NEXTPOL and MACFLOR projects, we have undertaken a 2-year comparative studies on floral phenology and changes of micro-morphological attributes of flowers in *Malva canariensis* and *M. wigandii* - two entomophilous sister species with Canarian and Mediterranean distribution, respectively-, and *Navaea phoenicea* -an ornithophilous

species, endemic from Tenerife-. As a novelty, seventeen morphological characters were daily analysed for the flower of the three species along the floral development. In addition, pollen-ovule ratio and pollen size were analysed to compare with the pollination syndrome. Floral phenology was divided into 7 stages (plus fruiting period), being four of them pre-anthesis (S0-S3) and three post-anthesis (S4-S6; this starts when petals are fully open and androecium is accessible), even if a post-anthesis substage S4.1 was observed for *M. canariensis* and *M. wigandii* (open flower with androecium completely exposed and indehiscent anthers). The total life-span of a single flower was 32, 31 and approx. 44 days, on average, for *M. canariensis*, *M. wigandii* and *N. phoenicea*, respectively (with a pollination period, S4 and S5: 4-6 days). In all cases, hermaphrodite flowers present short protandry and partial herkogamy. Therefore, there is an overlap in the presentation of the pollen and stigmas. Flowers of *M. canariensis* and *M. wigandii* exhibit an entomophilous pollination syndrome (with punctual concentration of nectar between calyx-petals base and colour guides in the nail of the whitish petal) while *N. phoenicea* has a patent ornithophilous syndrome (large amounts of nectar reward and petals with a uniform orange colour). On the other hand, morphological and biometric differences of petals were observed for *M. canariensis* and variety *hariensis*, with possible taxonomic implications. The combination of biometric data in phenological studies provides a more objective criterion to establish the developmental stages, allowing the extension to other species of the lineage and used as the basis for comparative transcriptomic assays.

OP29
Breeding systems of Azorean endemic species: an overview

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The flower, in angiosperms, is endowed with an extravagant diversity of forms and reproductive adaptations, promoting the transmission of genetic information to the next generations. In recent years, the endangered flora of the Azores has been the subject of several studies in the fields of molecular genetics and ecology. However, reproductive biology, being an important aspect for the *in* and *ex situ* conservation, remains practically unknown. Therefore, this study aimed to investigate the breeding systems of three endemic species of the Azores: *Viburnum treleasei* Gand.; *Picconia azorica* (Tutin) Knobl.; and *Azorina vidalii* (H.C.Watson) Feer. For each studied taxa we gathered information on ecological and population characterization, seasonal phenology, floristic inventory, and pollen/ovule (P/O) ratios. A temporal separation of the sexual phases (protandric dichogamy) was observed in *Viburnum treleasei* (Caprifoliaceae), with a very brief period of pollination occurring, after the flower opening, followed by the female phase, where the stigma finally appears receptive. *Picconia azorica* (Oleaceae) is an androdioecious and protogynous species, that shres great morphological similarities with the Macaronesian endemism, *P. excelsa*, as well as similar reproductive strategies. Cross pollination in *Azorina vidalii* (=*Campanula vidalii*, Campanulaceae) is promoted by the varied number of pollinators that visit its flowers, in search of pollen and nectar, namely insects, birds and, in some populations, the lizard, *Lacerta dugesii*. However, the occurrence of protandry does not rule out the possibility that self-pollination may occur within an inflorescence, but this may have implications in fruit production and percentage of viable seeds available, as seen in other species of *Campanula*. The findings reported here not only allows the

detection of reproductive failures, which constitute a major threat to the endemic flora of Macaronesia, but also to outline effective strategies for the recovery of endangered species.

OP30

Pollen-ovule ratios and breeding systems in Macaronesian taxa

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In order to analyse reproductive systems, Pollen/Ovule ratio is usually calculated. P/O ratio is a conservative indicator of breeding systems and reflects pollination efficiency i.e. the likelihood of a pollen grain reaching a stigma. According to Cruden (1977, 2000), P/O´s decrease in switches from xenogamous to autogamous species. Within the framework of MACFLOR projects (MAC/4.6d/190, MAC2/4.6d/386), P/O ratio of many Macaronesian endemisms has been analysed, including hermaphrodite taxa and species with different sexual systems. Pollen grains (software NIS-Elements_BR) and ovules per flower were counted, allowing to calculate the P/O ratio per flower. In gynodioecious species, P/O´s were calculated for hermaphroditic flowers; while P/O´s for monoecious or dioecious species were established at the population level, considering the pollen grains of male flowers and the ovules of female flowers. In this communication, the P/O ratios of about 80 Macaronesian endemic species (28 families and 42 genre) were analysed. Around 60% of species exhibited obligate xenogamous, 9% would show both obligate and facultative xenogamy, 9% were facultative xenogamous, and only 4% were facultative autogamous. Taxa with sexual systems (≈10%) or heteromorphic self-incompatibility system (≈9%) are also obligate xenogamous. Pollen/Ovule ratios may vary between species with similar breeding systems. Many different P/O values have been observed for Macaronesian endemisms exhibiting obligate xenogamy, e.g. Geraniaceae with minimum values (*Geranium reuteri* and *G. palmatum* P/O ≈750-1000), Fabaceae with intermediate P/O values ranging from P/O≈3.100 in *Retama rhodorhizoides* to P/O ≈13.500 in *Lotus kunkelii*, etc. to the maximum values in Brassicaceae P/Os ranging from P/O ≈2.100 in *Descurainia preauxiana* or P/O ≈4.300 in *Parolinia* sp to P/O≈60.000 in *Crambe sventenii*. P/O values seem to be good indicators of the breeding system if compared within genera or families.

OP31

The gynodioecy-dioecy pathway from hermaphroditism in two Canarian endemisms, *Bosea yervamora* L. and *Rumex lunaria* L.

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Gynodioecy is considered as a transitional stage to dioecy from hermaphroditism. In the projects MACFLOR1 & 2 (MAC/4.6d/190, MAC2/4.6d/386) both *Bosea yervamora* and *Rumex lunaria* have been included, the first one described as dioecious (Linneo *in* Webb & Berth., 1844) with female and male plants and the second one described as polygamous (Linneo *in* Webb & Berth., 1844) with female, male and hermaphrodite plants. Both are Canarian widespread endemisms and have not been included in either threat category, despite the fact that *B. yervamora* is very rare in Fuerteventura. With the aim of evaluating the functionality of morphologically hermaphroditic and male individuals, and to check the sexual system and labile sexual expression, the different types of flowers and the intensity of fruiting in several flowering periods have been analysed. *Flower morphology:* Two types of flowers have been observed: i) pistillate, with functional gynoecium and a vestigial androecium (staminodes), and ii) hermaphrodite that produce pollen grains and apparently viable ovules. *Fruit and seed set*: In *R. lunaria* and *B. yervamora* three sexual morphos have been detected: i) Female (47% and 43%, respectively) with a large fruit set, ii) Male (45% and 54%) which do not produce fruits and iii) Inconstant Male (8% and 3%) with some fruit set, but always lower than the female. *Germination*: The germination of the seeds of female individuals of *B. yervamora* (96%) does not differ from the inconstant males (90%), but in the latter the germination is anomalous, and seedlings are not formed. Both species are functionally dioecious, because although inconstant male individuals that produce various fruits are maintained in the populations, their contribution to the next generation is manifested only by their contribution to pollen.

Session 7:
Flora and vegetation - taxonomic novelties

OP32
Increasing the knowledge of the Macaronesia mycoflora: new records of basidiomycetes from the Azores

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This communication presents an updated catalogue of Basidiomycota taxa (including lichenicolous fungi and subdivision Pucciniomycotina) recorded in the Azores archipelago and reviews the published records to account for their taxonomic status. The number of Basidiomycota species that have been recorded in the Azores has risen sharply throughout the 20th century to 471 species based on field collections and the identification by several generations of local and foreign researchers. This study provides distribution data and includes changes in the nomenclature of the listed taxa. New sampling campaigns contributed to 130 new records of Basidiomycota for the Azores archipelago. In addition, there were new records for seven islands: 149 species found for the first time on São Miguel Island, 37 species on Santa Maria Island, 26 species on Flores Island, 22 species on Terceira Island, 5 species on São Jorge Island, 4 species on Pico and 3 species on Graciosa Island. Thirty-seven species are new records for Macaronesia. As a result of this study, 471 species of Basidiomycota are now listed for the Azores archipelago and a comparison is made with other mycofloras of Macaronesia.

OP33

New data on the *Exormotheca* (Exormothecaceae, Marchantiopsida) of Cape Verde. Insights from an integrative taxonomic study

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In Europe, the Macaronesian archipelagos stand out as a hotspot of biodiversity with high numbers of endemic plant species. The approximately 797 bryophyte taxa (including 56 endemics) of the northern Macaronesian islands (Azores, Canaries, Madeira) correspond to ca. 38% of the European bryophyte species richness. The southern Macaronesian Cape Verde archipelago harbours a high botanical diversity as well, but in contrast to northern Macaronesia, the bryophyte flora of Cape Verde is not yet well studied. Our previous research on the liverwort genus *Exormotheca*, in particular the disjunct distributed *E. pustulosa* was an important starting point to address biogeographic affinities and colonization patterns of the Cape Verde bryoflora. The results indicate a complex evolutionary history, including an African-Cape Verde connection and Rand Flora pattern. While the northern Macaronesian archipelagos share the same *E. pustulosa* lineage, Cape Verde was colonized by a distinct lineage. In this study, we aim to investigate the *Exormotheca pustulosa* complex and its relationship to other *Exormotheca* species that coexist in the same geographical areas, a reassessment of morphological characters and considering the previous phylogenetic results, and to present a formal description of a new *Exormotheca* species from Cape Verde Archipelago. The considerable lack of knowledge with respect to biodiversity of the southern Macaronesian bryophyte flora, hampers inferences about its geographic origin, ecological importance, and effects of climatic changes on the plant colonization and flora composition.

OP34

The complex evolutionary and taxonomic history of *Rubia* (Rubiaceae)

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The genus *Rubia* (Rubiaceae) comprises 88 accepted species distributed throughout the temperate and tropical regions of the Old World. Due to their high Alizarin content, the roots of several species, including *R. tinctorum*, *R. cordifolia*, and *R. peregrina*, have been important sources for purple dye since the Bronze Age. We studied morphology in combination with sequence data of 7 plastid DNA regions plus the nuclear ribosomal ITS region for 110 herbarium samples, representing 55 *Rubia* species. A biogeographic analysis reveals frequent long-distance dispersal and independent natural colonization of isolated islands like the Azores and Madeira, probably facilitated by frugivorous birds, who feed on the fleshy *Rubia* fruits. The concept of a widespread variable *R. peregrina* is not supported by our data. Instead, we argue for splitting *R. peregrina* into several more locally distributed taxa, which in most cases differ in ploidy level. For most of these taxa, a validly

published name is already available. We confirm that the Azores plants belong to the endemic *Rubia agostinhoi*, while morphologically similar plants from the Iberian Peninsula belong to several other species. We describe Madeiran plants as another single island endemic taxon, while *Rubia occidens* from the Canaries can also be found on the continent. Our study highlights the strength of an integrative herbarium-based approach to analyse plant groups with a complex evolutionary and taxonomic history.

OP35
Umbilicus (Crassulaceae) of Macaronesia

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With 12-17 accepted species, the genus *Umbilicus* is a species-poor lineage of Crassulaceae with a distribution ranging from the Mediterranean region to sub-Saharan Africa and Asia Minor. Five species are reported from Macaronesia: *U. gaditanus*, *U. heylandianus*, *U. horizontalis*, *U. rupestris* and *U. schmidtii*. We performed a comprehensive revision of the entire genus based on 182 DNA samples and morphological data from a large number of herbarium specimens to test species concepts and infer the historical biogeography of the clade. For the Azores, we identify two independent colonisation events originating from Western Europe. The taxon currently identified as *U. horizontalis* colonised the Azores c. 2 million years ago (Ma) and diverged into two distinct endemics. The closest relative on the mainland is *U. neglectus* (currently misplaced in *U. rupestris*). The third Azorean taxon is morphologically and genetically affiliated to *U. rupestris* and colonised the archipelago more recently (0.8 +/- 0.5 Ma). Madeira was most likely colonised from the Northwestern Mediterranean basin 0.7 +/- 0.5 Ma. The closest mainland relative of the Madeira *Umbilicus* is *U. pendulinus* (also currently misplaced in *U. rupestris*). Our analysis of 12 morphologically and ecologically different specimens revealed no genetic divergence within the island. In the Canaries, we find two endemic *Umbilicus* taxa: *U. heylandianus* (so far reported as a more widespread species) most likely colonized from Morocco c. 1.2 +/- 0.5 Ma. Specimens identified as *U. horizontalis* or *U. gaditanus* represent the other endemic taxon which is not close to either of the aforementioned species. Instead, it forms a clade with several currently undescribed species from northern Africa and the Mediterranean. Finally, Cabo Verde was colonized by two genetically distinct lineages 2-3 Ma and c. 0.8 +/- 0.5 Ma, one of them known as *U. schmidtii*. Our study thus increases the number of Macaronesian *Umbilicus* species from five to eight. All of them are endemic and go back to seven colonization events.

OP36
Comments on the Canarian flora and in particular on La Gomera

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Taxonomic studies on the flora of the Canary Islands are not at their best. Further taxonomic research is needed to resolve various problems both related to the typification of various species and to the revision of various groups such as *Argyranthemum* or *Sonchus*. Even well-studied families such as the Crassulaceae need to be reviewed in more detail. Given the problems to be studied, there does not seem to be an effective investigation to solve them at the same time that the number of researchers seems to decrease. In relation to its antiquity, the island of La Gomera has a very rich flora, but due to its orography and local climatic conditions, its flora is not yet fully known. Some aspects of the flora of this island are commented and some new species for science of the Santalaceae families are announced with a new taxon of the genus *Thesium* not included in the recent revision of the Canarian species and of the Compositae family. The identity of *Tolpis proustii* Pit., traditionally confused in the current botanical literature, is clarified and a new species of this genus is revealed. Other species, possible new taxa and new hybrids for the flora of the island are being studied.

OP37
Flora and vegetation of El Hierro. Canary Islands

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El Hierro, with its 269 km^2, is the smallest of the seven main islands comprising the Canary archipelago. Its vegetation is however varied, as the island peaks at 1,500 metres and each slope enjoys a different climate. El Hierro is thus a genuine biogeographic laboratory, demonstrating the multiple influences of environment on vegetation. UNESCO designated the island as a Biosphere Reserve. Published in French in 2021, as well as and in Spanish and English in 2022, a new book is here presented. This guide helps the reader not only become familiar with the flora and the vegetation of El Hierro but also recognize the main species found on the island. Plants are presented according to the principal types of vegetation. Each of the chapters presenting species ends with a selective, summary list of the characteristic plants. As for trees, pictures of their trunks make them recognizable by their barks and a key facilitates their identification. The Canary Islands humid subtropical forest (laurel forest) is a "living fossil", so much so that an excursion in this vegetation is like "entering a time machine", to get an idea of what Central European vegetation looked like before the Quaternary glaciations. El Hierro hosts 735 taxa of vascular plants, listed in the index (134 of them illustrated). The book, however, focuses on the native and endemic portion of this flora. The 30 El Hierro endemics are dealt with in a specific chapter, 18 of them being rock plants (e.g., *Aeonium valverdense*). There is a correlation between the density of El Hierro endemics and ancient steep cliffs, where diversification of these taxa took place. Most of the 22 genera with taxa endemic to El Hierro demonstrate strong adaptive radiation on the archipelago (e.g., *Argyranthemum*). Novel statistics are presented (numbers and percentages of endemic, native and introduced taxa on El Hierro).

Session 8:
Flora and vegetation - molecular evolution

OP38
Analysis of phylogeny and genetic diversity in *Micromeria* to determine the role of introgression and hybridization as base for adaptive evolution and ecological variability

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Diversification of island taxa is driven by the interplay between colonization and ecological opportunity, by the ability to evade competition and to expand into new habitats. Together, this can result in the remarkable adaptation pattern which are one signature of insular speciation. However, gene flow between species after secondary contact could lead to exchange of advantageous alleles and could play a major role in facilitating adaptation to new conditions thus accelerate the evolutionary response of colonizers. Especially the Canary Islands with their complex geological history provide a perfect arena to test related hypotheses. Several islands are composed of former independent islands or of areas of otherwise different origin. One example to show that these circumstances have a profound effect on adaptive diversification is *Micromeria*, a genus of the Lamiaceae. *Micromeria* occurs with about 20 currently recognized species on the Canaries, each species seems to be restricted to one island. So far, we studied the phylogeny of the genus using nuclear genes, the distribution of chloroplast haplotypes and geneflow pattern at microsatellite loci. We could show that even if all species are well circumscribed, genetic diversity is highly influenced by genetic exchange between species. This was especially pronounced in the younger species, indicating that the exchange might help to define their ecology. These data are now complemented with a high throughput analysis of multiple loci linked to genes to determine the extent of exchange of coding regions between species. Especially on the Canary Islands the high within species and population diversity can be paired with a pronounced ecological variability. The model provides a possible explanation for this finding and highlights the importance of adaptive introgression and the formation of hybrid swarm and syngameons as base of evolution.

OP39
Poales' phylogenetic structure across the Macaronesian Region

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Macaronesian Islands, in the North Atlantic Ocean, are well known for their singular biodiversity, which has attracted the interest of numerous biogeographers, ecologists and taxonomists. Within these archipelagos, the phylogenetic diversity of several important taxonomic groups is still unaddressed. Poales is a vast and taxonomically complex group with important ecological, economic, and ethnobotanical relevance at a worldwide level, which comprises a large proportion of the native flora in the Macaronesian Islands. Aiming to fill the gaps in phylogenetic diversity concerning large taxonomic groups, we investigated the alpha diversity of Poales through the Azores, Madeira, Canaries, and Cabo Verde Islands. The Poales within the Macaronesian archipelagos encompass five families (Bromeliaceae, Cyperaceae, Juncaceae, Poaceae and Typhaceae) and 476 total taxa, of which 60 are endemic (12.6%). Whereas six taxa are exclusively endemic to this region (occurring across the archipelagos), the remaining taxa are single archipelago endemics. Most of the Macaronesian archipelagos showed a tendency towards phylogenetic clustering, i.e., species within the community are more closely related than expected by chance. The Azores was the only archipelago where some islands showed significant phylogenetic evenness. At shallow phylogenetic levels, the distance between the closest related species tends to decrease at higher latitudes, whereas most of the Cabo Verde Islands showed significant phylogenetic clustering. Finally, correlating phylogenetic beta diversity to environmental variables will likely increase the resolution of these results, as beta diversity allows the testing of different hypotheses associated with mechanisms generating and maintaining biodiversity. Funding from FCT/AKDN (Project CVAgrobiodiversity/333111699) and Vanézia Rocha is supported by an FCT grant (SFRH/BD/151518/2021).

OP40

Genomic changes in Macaronesian Malvaceae with contrasting pollination systems: *Malva canariensis* and *Navaea phoenicea*

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The NEXTPOL project addresses a fundamental evolutionary question: What are the genetic mechanisms by which pollinator exert natural selection on floral structures of angiosperms? Our study system is formed by two endemic Macaronesian and one Mediterranean species of Malvaceae with contrasting pollination syndromes but shared phylogenetic history: the ornithophilous *Navaea phoenicea,* which belongs to the Macaronesian bird-flowered element, and the enthomophilous *Malva canariensis* and *Malva wigandii*. We used a genomic *de-novo* assembly and transcriptome-based differential gene expression assays to discover candidate genes that play a key role in the development and evolution of floral structures. Our comparative study has detected qualitative and quantitative changes in genes involved in structural and physiological traits grouped into three different flower/pollinator interaction stages. a) Attraction: we have detected changes in genes associated to the flavonoid/anthocyanin biosynthetic pathway in pre and post- anthetic petals and sepals, known to determine the suite of pigments shaping the visual reflectance spectrum for pollinators. b) Mechanical interaction: we have detected changes in epidermal cells associated to the differential behavious exhibited by each

pollinator to the visitor type. c) Reward: structural changes the reward step (a role played mostly by nectar) ensures the binding of the mutualistic network; we had established the correlation between nectar output and the size and thickness of secretory tissues in sepal trichomatous nectaries. Based on the previous knowledge of the transcription factor (CRC) gene and its conserved role across Malvales as the homeotic gene for nectary establishment, we detect unequal expression patterns that can be associated to nectar outputs between ornithophilous an entomophilous species. By using this dual genomic and transcriptomic approach, we gain insights into the mechanisms of evolution ocurring in pollinator-flower interaction shifts across the whole flower structure, which have so far being studied from an ecological perspective or on isolated traits.

Session 9:
Management and conservation

OP41
Assessing the environmental framework and dispersal ability of threatened Canarian endemic plants as a tool to improve their conservation status

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NEXTGENDEM (MAC2/4.6d/236) is an ongoing research project that provides a bioinformatic framework to address *ex situ* conservation questions through the analysis of multiple biotic and abiotic data associated with Canarian endemic species and their distribution areas. This context is increasingly allowing us to develop biotic and environmental characterizations of a large number of taxa endemic to Gran Canaria and other Macaronesian islands. In this communication, we pick out some representative actions suggested by the analyses of 25 Canarian endemic plants catalogued in different threat categories, which were selected as prominent examples of taxa that may require a holistic analysis to properly design management strategies that help ensure their preservation. We hereby present the results of an integrated Geographic Information analysis of multiple data layers related to ecological, geographic, biometric and reproductive parameters tentatively related to dispersal ability to improve their management and conservation status on the island of Gran Canaria, and to help propose new protected areas. Importantly, NEXTGENDEM actions have also substantially increased the representation of many Gran Canarian endemic species in our repositories and banks of biological samples and data, even increasing the number of living individuals in reinforced populations of highly threatened taxa, as *Sideritis amagroi* (Lamiaceae) or *Digitalis chalcantha* (Plantaginaceae), among other.

OP42
Preliminary quantification of the role of *Euphorbia balsamifera* dominated scrubland in the carbon stock of Tenerife, Canary Islands

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The consideration of terrestrial ecosystems as carbon sinks is usually linked to forests and arboreal species. However, in the Canarian archipelago there are mature ecosystems dominated by native shrub species that could be acting as sinks and contributing to the Canarian carbon stock. Scrublands occupy around 25% of the archipelago land area, and specifically, sweet spurge scrub occupies 13% of the scrubland zones of Tenerife. Here we present preliminary data about the total amount of carbon stored in sweet spurge scrub or "tabaibal dulce" on the island of Tenerife. The carbon stored in this community was calculated from the estimation of its amount of biomass per unit area and plant cover. A total of 15 plots of 400 m^2 were set up to achieve a representation of the community throughout the island. We measured all the individuals of a set of seven species that we considered major contributors to the scrubland biomass. Measurements included height, two diameters and basal stem diameters when possible. We built preliminary allometric equations using their volumetric data to estimate the dry biomass of individuals of *Euphorbia balsamifera, E. canariensis, E. lamarckii, Kleinia neriifolia, Launaea arborescens, Plocama pendula*, and *Schizogyne sericea*. Once the average of the carbon stored in the sweet spurge scrubland per unit area was calculated, it was extrapolated to the total area occupied by this plant community in Tenerife. The necessity of protection and conservation of the Canarian ecosystems with the aim of preserving the natural heritage is more than accepted. However, the ecosystem service of carbon sequestration done by native species, not only trees, but also shrubs, could be another reason for the conservation and restoration of natural and degraded areas, respectively, in the Canaries.

OP43
INVASION project: towards an integrative approach for the study of plant invasion processes on the islands of Tenerife and Gran Canaria

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The introduction of plant species by human action is currently one of the main threats against the conservation of biological diversity. When exotic species invade new territories, they significantly modify the structure of native communities and the ecosystem functioning. The mechanisms that modulate the stages of invasion are still under debate and deeply rely on exotic specific-level traits and their relationship with native communities. In this context, the Darwin Naturalization Conundrum (DNC) provides opposing hypotheses about the potential of exotic species to invade native communities. On one hand, the "naturalization hypothesis" posits that alien species far related with native species should be more likely to invade due to niche partition or niche emptiness (biotic filtering acting). On the other hand, the "pre-adaptation hypothesis" proposes that close relativeness of alien species with native communities may facilitate the establishment due to potential adaptations to similar environmental conditions (environmental filtering acting). In the INVASION project, we focus on three of the main ecosystems (laurel forest,

pine forest and dry shrublands) of the islands of Tenerife and Gran Canaria to study invasive processes under the framework of the DNC. Our main objective is to deepen our knowledge of the mechanisms of invasion in oceanic islands. We integrate ecological, functional, and phylogenetical approaches to explicitly test the hypotheses proposed in the DNC. Our preliminary results highlight that functional relatedness between exotic species and native community together with species richness have a role on establishment and invasion success.

OP44

Eradication treatments of an invasive species (*Ulex europaeus* L.) in Tenerife and their effect on local vegetation composition

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Understanding natural plant succession on abandoned areas is important for ecosystem restoration. However, invasive plant species affect natural processes. This is especially challenging in island ecosystems characterised by high biodiversity in reduced areas, where invasive species can displace endemic flora, impacting their development, reducing their distribution, and potentially leading to extinctions. In this study we test the effect of different eradication treatments on two abandoned agricultural areas in Tenerife (Canary Islands, Spain), which are currently dominated by gorse (*Ulex europaeus L.*). We applied four different treatments: mechanical, chemical, mixed (mechanical and chemical) and mixed with endemic flora plantation. Sampling was carried out monthly from January 2018 to January 2019. We use detrended correspondence analysis (DCA) to compare the effects of the different treatments and seasonal variation on vegetation composition. Preliminary results show that the most aggressive mechanical treatments generate changes in vegetation composition. Seasonal changes were also observed, but overall, we report that mixed treatments can help natural succession of native plants reducing gorse cover.

Session 10:
Management and conservation

OP45

A worrying arrival: The first record of *Rugulopteryx okamurae* in Madeira Island and its invasive risk

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The brown macroalgae *Rugulopteryx okamurae* is described as one of the most severe and threatening invasive marine macroalgae in European waters. This study reports the first record of *R. okamurae* in the Madeira archipelago, detected in December 2021, which represents a new southern distribution limit of this species in NE Atlantic European waters. Morphological and molecular characters were used to confirm the species' identity, and its potential invasion risk in Madeiran waters was screened using the standard risk assessment tool AS-ISK. Results show that *R. okamurae* has a medium-high risk of becoming invasive in Madeira Island under present and future climate scenarios. The greater risk of impact involves suppressing local species growth and the modification and degradation of local habitats, including trophic cascade effects. However, environmental and commercial impacts could also occur in case of an explosion of the invasive populations. This new introduction in Madeira coastal waters emphasizes the need for regular monitoring of *R. okamurae*, particularly to assess population dynamics to avoid establishing and further expansions. Finally, we recommend the evaluation of the possible derived impacts affecting rocky coastal communities and adopting the necessary mitigation measures and policies.

OP46
Invasive species and their control at Garajonay National Park

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Island ecosystems are very susceptible to biological invasions, the main cause of the mass extinction and habitat degradation processes affecting their biodiversity. Canarian laurel forest ecosystem is represented by Garajonay National Park in the Spanish National Park Network. Linked to the restoration of natural habitats, a control program of invasive species is conducted. The number of introduced vascular plants is estimated in 144 species. Monitoring and control data and detailed locations of 59 species are available, while the remaining 85 are mostly ruderal species, with occasional presence in bordering or degraded areas, with no recorded data. The introduced species occupy about 3.35% of the park area. Scattered specimens or patches extend on 54.4 ha, and other 64.7 ha are colonized by plants coming from seed banks in former restored areas or correspond to remaining exotic forest plantations. In order to prioritize management, plant species have been grouped into categories, according to type of affected area, invasion degree, current impact and invasive potential. Sixteen species are considered priority invasive species because of their high impact and invasive potential. Other twenty exotic species are also invasive or potentially invasive, but their management is not currently considered of maximum priority. The greatest control efforts have focused on the two most invasive species. Thus, the affected area has been reduced by 86% for *Tradescantia fluminensis* and 40% for *Opuntia maxima,* from 2009 to the present. Populations of many rare and endangered species of flora are still growing on the invaded areas, so a habitat restoration program has been developed during the last decade. This includes supporting natural recolonization by planting or seeding those species. Increase of native species coverage after the intervention has been observed, changing from 12% to 54% five years later, together with a favorable establishment of the rare or endangered species.

OP47

RedEXOS, the early warning network of the Canary Islands for the detection and intervention of invasive alien species

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RedEXOS is the official Early Warning Network of the Government of the Canary Islands for the prevention of establishment of new outbreaks or populations of invasive alien species (IAS) or those with invasive potential in the Canary Archipelago. Biological invasions on islands have become a major driver of biodiversity loss since isolated biotas are more sensitive to alien species. In this context, RedEXOS is articulated as a network for early detection of IAS, with citizen collaboration being a fundamental backbone for its achievement. RedEXOS' working group is constituted through different collaborating administrations involved in IAS management, nature conservation research institutions, external specialists, and non-governmental organizations within the environmental sector. RedEXOS has developed a platform, consisting of an App and a website, designed to collect and coordinate information on the sightings of exotic species in the Canary Islands. The novelty of this platform as opposed to other similar platforms is the development of two approaches that can interact with each other: a technical one, directed to specialized profiles in IAS management, and another focused on citizen science reporting. Reports made through RedEXOS platform are validated by an expert taxonomist. Contact can be made with particular users through RedEXOS' App chat feature. This direct communication channel allows to obtain verified information such as taxon or location. When RedEXOS intervention team acts upon an early warning sighting, a report is sent back to the user with information on actions taken. Early detection and intervention of IAS in new locations and areas of high ecological value has been proven to be more efficient economically and in regard to invasive species successful eradication. RedEXOS platform currently has more than 1,500 registered users, with more than 400 different taxa reported and more than 7,000 validated reports, of which more than half correspond to interventions on IAS.

POSTERS

P1

Modelling the potential distribution of alpine and pine forest species in La Palma and Tenerife in the context of climate change

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One of the main consequences of climate change are the shifts in the potential distribution of plant species. Different intensities of climate change, as well as different species adaptation capacities will result into complex changes in ecosystems structure and composition in the coming decades. Alpine ecosystems are among the most sensitive to this type of shifts due to the limited area that usually characterizes them and because

climate change effects are being more noticeable there. The summits of La Palma and Tenerife are a clear example of this problem. While it is expected a rise in altitude and a consequent constriction of the potential area of the alpine ecosystem on both islands, the surrounding areas at lower elevation which correspond to pine forests have generally been poorly studied. In this work, the recent past, present, and future potential distribution of more than 60 species of pine forests from La Palma and Tenerife is preliminarily evaluated through species distribution models performed in Maxent 3.4.1. We verify the climatic adaptation capacity of these species to higher altitude environments and how the space is going to be shared with other 47 alpine ecosystem species in the future. In general, it is observed that the species from the pine forest tend to ascend, reducing in most cases their potential area and occupying zones that currently are dominated by alpine species. In certain cases, species tend to expand through flat areas as it occurs in the base of Mount Teide. While in Tenerife both ecosystems will continue to have a representative area in the farthest scenario, in La Palma the pressure on the already limited summit ecosystem will increase.

P2
Road impact on plant species colonization in primary succession, Timanfaya National Park

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Roads alter natural ecosystems, facilitating the colonization and dispersal of plant species in areas which may be particularly sensitive. This is of great concern in places such as the Timanfaya National Park and Los Volcanes Natural Park, due to their volcanic nature and where ecological succession is taking place after a recent eruption process (1730-1736, and 1824). Road edges favour the establishment of introduced species and some native ones which, thanks to the buffer provided, are able to spread and settle in this arid environment. Our hypothesis states that species cover differs border vs. interior, being higher at the border. Native and non-native vascular plant species were recorded at 66 sampling locations along 20 km of different zones and road types. We analysed the effects of distance from road on species richness patterns and beta-diversity at two distances from the edge of road (0-1 and 2-3 m) on both sides of the road for three years, in the wet and dry season of each year in seven different zones. Preliminary results revealed a high environmental variability between the sampled zones. There was a higher species cover on the roadside compared to the interior, and with respect to road type (Tukey test, $p<0.05$). High species richness was detected on the public road (the free entrance to the National Park) and on the dirty private road (in Tremesana, where people often go for walks with their pets). The analysis of the road edge effect is useful to understand how infrastructure causes environmental variability and puts this protected natural area at risk, changing the colonization capacity and favouring the entry of invasive species. This study is part of the project "Nuevas actuaciones para el control de la calcosa", funded by Centros de Arte, Cultura y Turismo de Lanzarote.

P3

Comparing supervised classification methods to predict and identify forest vegetation-types of Western Iberia and Macaronesia

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Given a set of previously classified vegetation relevés, supervised classification procedures can be then applied to either: i) assign new relevés to vegetation-types or ii) to predict vegetation-type's occurrence. In assigning vegetation-types, floristic-abundance data is parsed; while in predicting environmental information associated to relevés, if available, is used instead. We compare several methods of supervised classification to classify and predict woody vegetation types both in Western Iberia and Macaronesia. Methods include both i) rule-explicit producing, such as classification trees (CART), induced classification rules or COKTAIL 'family'; ii) and 'black-box'or learners. An initial training-set of synthetic tables expressing syntaxonomy is used. A set of ca. 2700 unclassified relevés is then parsed by rule-based (CART, COCKTAIL) and 'black-box' methods (random forests, gradient boost, SVM, naïve Bayes) or combinations of the later. By weighing quantitative and practical trade-offs of all methods, we found that 'black box learners' may be more accurate at times, but rule-explicit expert systems are easier to implement and have interpretative value. We come to propose an-easy-to-use rule-based expert-system for Macaronesian vegetation.

P4

Preliminary reconstruction of the Chibanian paleoenvironment in the north of Tenerife from phytoliths

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During the Chibanian on the island of Tenerife (Canary Island, Spain) different explosive volcanic events related to the formation of Las Cañadas volcanic edifice took place. The pumiceous eruptive materials expelled during this event reached the north coast of the island and buried the dune formations that constituted at this time a coastal dune ridge. An example can be observed in the paleontological site of Milan (Anaga Massif), object of this study. At the top of the dune formation, three pumice deposits were preserved, among which edaphogenic processes were produced. Three samples with evidence of phytoliths and other silica microfossils from each of the paleosols deposits were studied. Their extraction was carried out using a protocol for the study of microfossils in their edaphic context. As a result, it was concluded that the most recent sample (rubefacted paleosol or *almagre*) contains a lower percentage of phytoliths than the older ones. The preliminary analysis of the samples confirms the presence of phytolith assemblages belonging to at least three subfamilies of grasses, some of which no longer inhabit the Canary Islands or are considered non-native. Along with these, evidence of a scattered palm grove has been found. Our results draw firstly some carrier materials that can be proposed as incipient

paleosols, developed under weathering processes from pumice deposits, probably in an interglacial period. Waiting for more data on the analyzed samples, we can confirm that part of the vegetation developed in these paleosols was type C3 and C4 grasses, as well as palms to a lesser extent. Authors thank Dr. Julio de la Nuez Pestana and Dr. María Luisa Quesada, retired professors; and Drs. Carmen Concepción Jiménez, Carmen Dolores Arbelo and Dolores del Castillo, from the Department of Animal Biology, Edaphology and Geology for their collaboration. This research has received support of the CajaCanarias Foundation research project 2017REC "Anaga Paleopark" and by the grant PID2020-114982RA-I00 funded by University of La Laguna and the Spanish Ministry of Science, Innovation and Universities.

P5
Fire effects in bryophytes along an elevational gradient in the Canarian pine forest

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The Canarian pine forest is one of the most disturbed ecosystems from the Canaries because of the over-exploitation in the past, the introduction of invasive herbivores and the increase in size and frequency of fires. Fire produces habitat destruction and intensifies erosive processes and land degradation. Previous studies using vascular plants do not showed the fire effects because pine forests are highly impoverished due to the herbivore pressure, which represents a permanent stress factor. Bryophytes are distributed in almost every terrestrial ecosystem around the world and have a wider distribution and longer altitudinal gradient than vascular plants. Their sensitivity to the environmental changes due to their poikilohydric nature and their strongly relationship with the substrate make them useful bioindicators of forest quality. It is especially interesting that bryophytes are less palatable to the invasive herbivores than endemic vascular plants which make them a useful group to test fire effects in highly impoverished forests. Here we analyse bryophyte species richness and composition along an altitudinal gradient (200-2000 m a.s.l.) comparing burnt (in 1995) and control plots (non-burnt in the last fifty years). A total of 642 samples were randomly collected in all available substrates. A total 120 species were identified along the elevational gradient, 111 in control and 81 in burnt plots. Our results show that control plots have significantly more cover and species richness than burnt plots in all studied substrates and vegetation belts. According to their life strategy, burnt plots showed significantly more abundance in colonist species than the control ones. By contrast, perennials and long-lived shuttle species are more frequent in control than burnt plots. Our study highlights the importance of quantifying disturbances effects using appropriate reference ecosystems and shows that fire in the pine forest represent a strong disturbance factor.

P6
How do plants respond to fire in alpine ecosystems? Evaluation of the direct effects of fire in high mountain species of the Canary Islands

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Wildfires are part of the dynamics of many terrestrial ecosystems. Despite this, they continue to be one of the greatest threats to biodiversity conservation, especially on islands, as they are small territories and, in general, have a high percentage of endemicity. In the Canary Islands, there has been a considerable increase in the frequency of fires in recent years. Teide National Park is not an exception. In 2019, a fire of considerable extension was registered, affecting the summit scrub of the Park, an ecosystem in which the information of the influence of fire on the vegetation is totally non-existent. This work aims to study the response to fire of the main representative species of summit scrub when exposed to a direct source of heat by studying their flammability attributes. Although all flammability attributes responded to changes in leaf water content, important differences between species were reported. *Descurainia bourgeauana* had the highest ignitability, while *Spartocytisus supranubius* and *Adenocarpus viscosus* were the species with the highest flame sustainability. More flammable species are dangerous for the ecosystem, as they are more likely to cause and/or spread a fire. Our results highlight the need for management and control of fires in the summit scrub in order to reduce or preserve the impact of fire in the National Park.

P7

Volcanically baked killarney fern fossils (Hymenophyllaceae) from the Holocene of the Azores (Portugal)

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Among the most delicate native plants present in the Azores archipelago flora (central Atlantic Ocean, Portugal) are the Hymenophyllaceae ferns, known as filmy ferns. This family is represented by nine genera and *ca.* 1000 species occurring globally in tropical and temperate regions. In the Azores, three native taxa occur: *Hymenophyllum tunbrigense* (L.) Sm., *H. wilsonii* Hook. and *Vandenboschia speciosa* (Willd.) G. Kunkel (≡*Trichomanes speciosum* Willd.). Morphologically, one of the key characteristics of the filmy ferns is the thin, fragile, translucent, usually one cell thick lamina that lack stomata imposing that these taxa can only grow in shadow and high humidity habitats. However, from a palaeobotanical point of view, these characteristics seem to promote rapid decay, leading to a low fossilization potential, revealed by a worldwide scant macrofossil record of Hymenophyllaceae. Here we describe the first macrofossils of Hymenophyllaceae from Macaronesia archipelagos with exquisitely cuticular preservation. Preserved morphological characters closely match the killarney fern *Vandenboschia speciosa*. Fossils, preserved within a highly vesicular ash-fall tuff baked by a pyroclastic density flow 1200 yr. BP old, are three dimensionally incorporated in the matrix and preserved as impressions with cuticular preservation with rare and minute areas of charcoalified material. A single specimen presents three dimensional silicified cells. Fossils were prepared under a stereomicroscope using the 'dégegement' technique. In total a subset of 32 specimens containing 52 fossil fern impressions were studied. This poster aims at taxonomically evaluate and illustrate these fossils and discuss its peculiar taphonomical aspects and ecological implications.

P8

Assessing climate change vulnerability of restricted and widespread plant species on alpine habitats in two oceanic islands

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The alpine ecosystems are especially interesting to assess species vulnerability, since they occupy areas that are experiencing strong climate change effects in a short time, just in the last few decades. This is of special concern on the alpine ecosystem of oceanic islands, due to their characteristic higher endemicity rate and small area. During the last decades there has been an increasing interest about the effects of climate change on biodiversity and many methods have been developed to assess species vulnerability. The species response to the climate change is narrowly dependent on the species range-size and to better understand their determinants is essential to identify potential risks for species and habitats. Patterns of commonest and rarity mostly depend on the fundamental niche breadth, evolutionary age and dispersal limitation, but it is also frequently produced through human disturbances. On oceanic islands, one of the most important anthropogenic factors are the invasive herbivores, that represent a stress factor that change the species distributions patterns and consequently their response possibilities to the global warming. But there are other specific drivers that may be influencing the species answer on oceanic islands that here are analysed. Here, we evaluate in the alpine area of two oceanic islands (Tenerife and La Palma), the variables that best explain the vulnerability of 63 endemic species along three scenarios (recent past, present, and two future projections for the periods 2041-2060 and 2061-2080). We also analysed whether endemic island alpine species with a restricted distribution are more predisposed to have higher vulnerability than widespread species, by quantifying along these three climate scenarios differences in a) overall vulnerability among restricted and widespread species b) non-climatic stressor scores among restricted and widespread species, and c) climatic stressors factors differences among restricted and widespread species.

P9

Project: A trident of invasive grasses (*Pennisetum-Melinis-Setaria*): colonization of the territory or distribution of the niche?

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Fountain-grass, *Cenchrus setaceus* (Forssk.) Morrone (syn. *Pennisetum setaceum* (Forssk.) Chiov.), is an invasive species which greatly expands in Tenerife, Gran Canaria and La Palma, outcompeting endemic flora. In the last years, across islands, weaken plants with symptoms like stunting, chlorosis and browning of leaves, leafspots and blackened leaves have been observed. However, the drivers of these signs are unknown. Likewise, the evolution and expansion of these symptoms to other populations, or the effects on the

germination capacity are veiled. To fill the gap in these questions, we developed a study in 24 plots covering different environmental conditions in Tenerife (Canary Islands). We monitored 50 individuals per plot in the dry and the wet season. Plant overall parameters like i) phenology, ii) size range (plant volume), iii) plant health status (symptoms presence and scale) and iv) number and health status of inflorescences were recorded. Differences in fitness of the plants were found among plots but not between zones (north and south) with bigger plants more affected than smaller ones and the health status weakening after 8 months (Tukey, $p<0.05$). To determine the effect of the plant fitness on the germination capacity, ten healthy and ten weakened individuals were selected in five plots per zone. Similar metrics were recorded adding fecundity parameters like number of inflorescences, flowers, seeds, and floral stem length. We sampled mature inflorescences and tested germination capacity of 100 seeds per health status and plot in growth chambers. Seeds of affected plants in the south germinated slower and in lower number than the healthy ones in the same area or the north ones, irrespective of their health status (Tukey, $p<0.0$). Dry conditions of the south may contribute to the weakness of individuals, lowering the germination capacity. These results are valuable to prioritize management strategies for the control of fountain-grass.

P10
Effects of climate change on range size and functional traits of the Canary Islands' flora

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Islands possess unique floras with a high proportion of endemic species that are functionally specialized to specific climatic niches due to their evolution in isolation. These floras are expected to be severely affected by changing climatic conditions as they have limited range and population sizes. However, so far it is not known how climatic alterations affect range size and trait shifts of native island plants. Here, we gathered species occurrence data from single-island endemic, multi-island endemic, and non-endemic native plant species on the Canary Islands, as well as data on current climatic conditions and future climatic predictions. We further collected data on plant functional traits (growth form, woodiness, and succulence). Subsequently, we conducted species distribution modelling for current and future climatic conditions and calculated the relative difference in potential climatic suitable area for ~70 % of the native Canary Island flora. We found that on average all floristic groups lose climatic suitable area. However, single-island endemic species

might lose a greater proportion of their climatic suitable area than multi-island or non-endemic native species, especially those that might experience severe drought in the future (i.e., on Lanzarote and Fuerteventura). Moreover, we found that forbs are more likely to lose climatic suitable area than shrubs or subshrubs in single-island endemics. Overall, herbaceous species might lose more climatic suitable area than woody species in single-island and multi-island endemics. Succulence has an important role in climate change resilience in single-island endemics and non-endemic natives. We emphasize the conservation importance of all native species, but especially of single-island endemic species, which might experience severe drought in the future, or which are not characterized by drought-resistant traits, such as woodiness or succulence. This potential loss is alarming as currently protected as well as non-protected native plant species are similarly affected by changing climatic conditions.

P11
Diversity of Desmidiales in freshwater systems of the Azores archipelago

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The Desmidiales are a diverse group of unicellular green algae that are primarily found in freshwater ecosystems. They can be identified and distinguished from other algal groups by the symmetry and ornamental structure of their cells. They have a worldwide distribution, but their presence and diversity in the Azores archipelago have received relatively little attention. The Azores are in the Northern Atlantic Ocean and are particularly rich in freshwater ecosystems. Since the Water Framework Directive (2000/60/EC) demanded the establishment of biomonitoring programs for European freshwater ecosystems, Azorean freshwater systems have been regularly sampled. Here we present the diversity and distribution of Desmidiales in several freshwater habitats (lakes, streams, and peatlands) of the Azores. Peatlands showed the greatest diversity of Desmidiales, especially hollows and drainage channels, which were dominated by large species of the genus *Euastrum* and *Closterium*. *Cosmarium* spp. dominated the littoral zone of the lakes, while *Staurastrum* spp. were the most representative genus of planktonic taxa. Streams presented poor diversity of Desmidiales. Although larger datasets covering different habitats and environmental gradients are required to understand better how these communities respond to environmental changes. The diversity of the group and the overall resistance of their cell wall, allowing their preservation in the fossil record, makes it a promising group for paleoenvironmental reconstruction.

P12
Intra-specific leaf functional traits on laurel forest tree species reveal different strategies of adaptation to climatic conditions

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Functional traits reveal different adaptation strategies to environment conditions, being considered to infer processes driving species assembly. One of the most sensitive

Macaronesian ecosystems to climatic conditions is the Canarian laurel forest, a heterogeneous cloud forest. Here, we analysed leaf functional traits for sunny and shade leaves of five tree species (three widespread and two restricted) through a climate gradient in the Canarian laurel forests on Tenerife. Our goals were to evaluate if the climate conditions drive changes in foliar traits between populations for studied tree species; and if the phenotypic plasticity between sun leaves and shade leaves is similar among species. For this purpose, five individuals per tree species were selected in eight sample sites distributed on Tenerife laurel forests. Six sunny leaves and six shade leaves per tree individual were chosen, being calculated the leaf area, specific leaf area and leaf dry matter content for each leaf at the lab. Results revealed different strategies depending on the tree species. *Ilex perado* showed a high plasticity between sites driven by the climate conditions, but a low variability between sunny and shade leaves. By contrast, for widespread species such as *Laurus novocanariensis* and *Morella faya* a low plasticity between populations with different climatic conditions was obtained. However, a clear leaf dual strategy (sunny vs. shade leaves) at individual scale was obtained for these two species. Our results represent a contribution to the understanding of the current distribution of laurel forest tree species and their adaptive capacities to the climate change scenarios, being the most sensitive species to the climate conditions the ones with the worst adaptative capacity to the current global warming.

P13
Extremophile microalgae colonizing new lagoon habitats of the Tajogaite volcano deltas

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On September 19, 2021, the volcanic eruption of La Palma started around Cabeza de Vaca, nearby El Paso (La Palma, Canary Islands). The eruption ceased on December 13 after 85 days of eruptive activity, as the longest historical eruption ever reported on the island. After the magma emission ceased and the cooling of the lava flows occurred, life emerged rapidly in the intertidal and sublittoral environments of the lava deltas. Fifty days after the cessation of the volcanic activity, the Marine Botany group (BotMar) of the University of La Laguna visited the island to supervise the process of establishing a new ecosystem and carried out the first samplings of a long-term study. We spotted a tidal lagoon in one of the deltas (Tazacorte shoreline) formed by marine infiltration, varying its depth according to the tidal movement. The new formation lagoon shows high temperatures (37-41ºC) compared to the seawater temperature along the seashore. Such an extremophile habitat exhibits high biodiversity of microalgae able to carry out their life cycle under these stressful environmental conditions. The present study aims to describe the most abundant genera of microalgae associated with the new lagoon. Thus, several microalgae genera were reported, some of them corresponding to the Phyla *Cyanobacteria* and *Bacillariophyta*.

P14
Is the soil very dry and saline? It doesn't matter, I can reserve a lot of water

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Plants are sessile organisms, which are continuously challenged by various biotic and abiotic environmental stresses, such as soil salinity, extreme temperatures, drought, nutrients deficiency or pathogen attack. In saline soils, the ability of plants to grow and complete their life cycle can be severely compromised. Plants develop various physiological and biochemical mechanisms to survive in soils with high salt concentration, and one of the most important is the specialization of their tissues in the reserve of large amounts of water. *Mesembryanthemum crystallinum* L. and *M. nodiflorum* L. are therophytes plants of African origin introduced in the Canary Islands. These species, together with others, form communities that frequently, after the autumn-winter rains, form various polychrome tapestries that evenly cover the substrate. The objective of this research is to study the anatomical characteristics that make these species inhabitants of one of the most adverse soils of the Canary Islands. Samples were collected in Punta del Hidalgo (Tenerife) and a histological protocol was performed that included tissue fixation, dehydration, paraffin embedding, microtome cutting, rehydration, staining, and permanent mounting. At the root level, a very high development of the xylem is observed in both species, which occupies more than 80% of the structure. In *M. crystallinum* the anatomy of the stem continues to be specialized in transporting large amounts of water, however, in *M. nodiflorum* the stem already constitutes a large reservoir of water, with a highly developed aquiferous parenchyma. In the leaves transversal-sections, the vascular bundle is quite reduced and more than 95% of the structure is made up of water-bearing parenchyma. Thus, there is no doubt that the survival of these species is assured in the face of future soil degradation and droughts in the scenario of climate change.

P15

Unravelling the taphonomic signals of Pleistocene palaeoflora: first evidence of *Euphorbia* L. fossils from Tenerife (Canary Islands)

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One of the causes of the conservation of plant fossil remains is a rapid burial due to catastrophic events. The taphonomic processes involved make it possible to find remains of the flora that lived in a certain area in a life position. On Tenerife Island, the explosive volcanism associated with the formation of the Cañadas volcano created ideal conditions for this type of conservation. The objective of this work is the taphonomic and morphological study, as well as the taxonomic attribution of new fossil remains found in a new Pleistocene site in the Bandas del Sur region (Tenerife, Canary Islands). The results of the analysis of the fossil material and the comparisons with the current plant close relatives in the study area, allowed us to assign this material to Canary Island spurges (*Euphorbia canariensis*). On the other hand, the arrangement of the remains in the bed indicates that they were buried *in situ* and allows us to reconstruct the vegetation that grew in the study area. This finding increases the knowledge of the Pleistocene flora of Tenerife, from a period prior to the arrival of human beings. The study of these materials will also provide information on the morphological changes of *E. canariensis*, which is included as a protected species of the vascular flora of the Canary Islands nowadays. Moreover, this

palaeobiological study provides information about the response of the biota to catastrophic events, such as volcanic eruptions, of great interest for biodiversity conservation.

P16
The contribution of the HMS Challenger to the mycota of the Canaries: the collections housed in the Royal Botanic Gardens, Kew

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On the eve of the 150th anniversary of the HMS Challenger expedition, we study its contribution to the mycota of the area, in particular the non-lichenised fungi collected in Tenerife in February 1873. These were collected by H.N. Moseley while attempting to reach the 'Pico' of el Teide (1879, Notes by a 'naturalist' of the 'Challenger'. Macmillan & Co., London). Moseley, a zoologist by training, managed to gather a small but systematically diverse collection of fungi, encompassing discomycetes, a new species of coral fungus, agarics, a gasteromycete and a jelly fungus. A mere 13 fungi were enumerated by the British mycologist M.J. Berkeley (1875, J. Linn. Soc., Botany 14: 350-354), all of which were new records for the islands. This publication together with a few others on algae preceded much of the literature associated with the expedition, which expanded after a general report given by C. Wyville-Thomson (1876, Nature 14: 492-495). Our aim is to understand the biological objectives of the expedition in terms of the taxonomic groups collected, how they were preserved during the voyage and prepared for dispatch, duplicate distribution, etc. For that we consulted the Director 's Correspondence and other information sources in the Archives of the Royal Botanic Gardens, Kew. In the Fungarium of the same institution, we located and digitised the collections from the expedition and recognised other historical material pertaining to the islands. We ascertained the curatorial status of the collections, and we intend to reexamine morphologically and illustrate the material to confirm its taxonomy. Lichens were also collected from Tenerife by the expeditionaries, but contrary to J. Stirton's record (1880, J. Linn. Soc., Botany 17: 152-157) these are not currently housed at Kew; some maybe found in the Natural History Museum, London and will be investigated in the near future.

P17
Morphology and taxonomy of the Madeira Island (Portugal) endemic *Musschia aurea* (L. f.) Dumort. (Campanulaceae)

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Madeira and Desertas Island present a bioclimatic contrast and habitat diversity which result in a morphological differentiation of the vegetation, and, at the same time with the isolation of populations, originating endemic species. The species of the *Musschia* genus are true examples of adaptive radiation. *Musschia isambertoi* M. Seq., R. Jardim, M. Silva & L. Carvalho is a monocarpic chamaephyte which grows in communities exposed to sea air (*Crithmo-Helichrysetum obconicae*); *M. wollastonii* Lowe is a monocarpic

microphanerophyte typical of the stink-laurel forest (*Clethro arboreae - Ocoteetum foetentis*) characteristic of caulirosetted phanerophyte communities that occurs in forest clearings, landslides and stream beds; and lastly, *M. aurea* (L.f.) Dumort is a perennial chamaephyte that lives in crevices of rocky cliffs of Mediterranean climate and in the inside of the valleys of Madeira island, exposed to Temperate climate (*Sinapidendro angustifolae–Aeonion glutinosi*). *Musschia aurea* populations found inside valleys was first recorded in 1815 by Ker Gawler (1764-1842), that showed a narrow leaf (β *angustifolia*) in comparison to other populations showing wider leaves (α *latifolia*). Later, in 1822, along with the *M. aurea* description, Dumortier described another species for the genus, *M. angustifolia* Dumort., referring to the populations that were inside of the valleys. However, the species has never been accepted by the later authors and since then the plants with the narrow leaves are mentioned but considered as *M. aurea* (L.f.) Dumort. In this work we present a biometric analysis performed on 47 specimens collected from 36 populations. All the known populations were georeferenced. A total of 57 quantitative characters were registered. Exploratory analysis includes Principal Component Analysis (PCA), Principal Coordinates Analysis (PCoA), and clustering based on Euclidean distance coefficient and Pearson Correlation, using Unweighted Pair-Group Method using Arithmetic Average (UPGMA). Results support the morphological recognition of two distinct taxa.

P18

Reappraisal to the Madeira archipelago *Vicia* L. (subg. *cracca*, sect. *cracca*) taxa, based on molecular and morphological data

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The genus *Vicia* includes up to 160 species. In Macaronesia 29 taxa are currently recognized, in the Azores archipelago, a total of 11 *Vicia*, all introduced, except for the extinct endemic *Vicia dennesiana*. In the Canary Islands, 21 *Vicia* taxa are listed including seven endemics (*Vicia chaetocalyx*, *V. cirrhosa*, *V. filicaulis*, *V. nataliae*, *V. scandens*, *Vicia voggenreiteriana* and *Vicia vulcanorum*). For Madeira, 16 *Vicia* taxa are recognized including the endemics *V. costae* (Porto Santo), *V. pectinata* and both *V. capreolata* (Madeira and Desertas) and *V. ferreirensis* (Porto Santo) included in *Vicia* subg. *Cracca* sect. *Cracca*. Populations corresponding to putative *V. capreolata* (Madeira and Desertas) and *V. ferreirensis* (Porto Santo) were georeferenced and a new distribution map is presented. Leaves were collected from 64 plants corresponding to 21 populations [17 populations, 40 individuals of *V. capreolata* and 4 populations, 24 individuals of *V. ferreirensis*] aiming to obtain DNA to estimate genetic diversity and population differentiation using ISSR markers. To infer a molecular phylogeny estimate, we produced a total of 6253 aligned nucleotides including the nuclear ribosomal ITS region, two coding chloroplast DNA regions and three non-coding chloroplast regions. Polymerase chain reaction was done using KAPA HiFi polymerase. The PCR products were cleaned and then sequenced (GENEWIZ Inc.). The newly sequenced Madeiran material was combined with the existing sequence dataset of the herbarium study by Schaefer et al. (2012), which resulted in a final combined alignment of 489 Fabeae sequences plus eight outgroups. 30 morphological characters were recorded on 35 plants (20 putative *V. capreolata* and 15 putative *V. ferreirensis*). Preliminary results suggest that Madeira Island's *Vicia capreolata*

could correspond to distinct taxonomic entities comprising two distinct clades. Furthermore, the Porto Santo endemic *V. ferreirensis* corresponds, surprisingly, also to two distinct clades, which are both supported by ISSR analysis and morphological data.

P19
Results of the monitoring of the species *Camptoloma canariense* (Webb & Berthel.) Hilliard

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In September 2021, the monitoring of *Camptoloma canariense* began for the project (NEXTGENDEM, MAC2/4.6d/236) which is co-financed by the Interreg MAC Cooperation Program 2014-2020 with the participation of Gesplan and coordinated by the Jardín Botánico Canario "Viera y Clavijo". *Camptoloma canariensis* is an endemic species of the island of Gran Canaria (Canary Islands). On the island there are about 34 confirmed populations to which 21 new localities are added, 6 of them to be confirmed at present. This species has a circuminsular distribution in an altitudinal range of 20 to 1,100 m and it can be found in several types of habitats, each with differences in the structure of populations. On the one hand, we have those populations that are associated with humid areas (wet rocky escarpments, wet rocky escarpments with springs and palm groves associated with petrifying springs). On the other hand, there are the populations in caves or aboriginal sites. The methodology to cover the monitoring focused initially on the search for cited nuclei of the biodiversity database of the Canary Islands and on the collection of bibliographic material that defined their distribution. The field work consisted of locating the populations and making several surveys in which multiple data were collected: 1) census of the species in three age groups (adults, juvenile and seedlings), 2) accompanying vegetation, 3) threats (colonization by invasive species, herbivory, or anthropic pressure), 4) collection of photographic material and 5) collection of genetic material (samples, seeds and leaves). After the monitoring campaign, the data has been analysed and treated in order to understand its dynamics, distribution and threats. As a result of the processing of the data, several maps and a table have been created that serve to represent their reality in our territory.

P20
Musschia wollastonii Lowe (Campanulaceae) reproductive biology and pollinators of a Madeira Island (Portugal) endemic

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The knowledge of reproductive biology is important for developing conservation efforts, especially of endangered endemic species with few populations. *Musschia wollastonii Lowe* is a rare monocarp Madeiran endemic species, typical of the stink-laurel forest (*Clethro arboreae-Ocoteetum foetentis*) characteristic of caulirosetted phanerophyte communities that occurs in forest clearings, landslides, and stream beds. This taxon has a

complex reproductive biology in which the presence of protandry, weak dichogamy and an unusual mechanism of secondary pollen presentation on the abaxial surface of the stigmatic lobes may simultaneously facilitate alogamy and autogamy. However, its selfing capability, pollinator dependency and incompatibility system are unknown. The current study took place between August 2021 and February 2022 in a population, split into 2 subpopulations, with low human disturbance. The reproductive biology was studied through fruit and seed production after the following controlled pollination treatments: (1) natural pollination; (2) self-pollination; (3) auto-incompatibility; (4) cross pollination and (5) supplementary pollen. Additionally, the flower visitors were observed during different times of day (from 10:00 a.m. to 04:00 p.m., GMT+0) where visits and visitor behaviour were recorded for a series of 15 minutes censures. Visitor specimens were captured for subsequent identification. *Musschia wollastonii* has a high possibility of self-pollination either through autogamy or geitonogamy, although incompatibility mechanisms may play a role in final seed formation. Our observations confirm previous studies that identify pollen collectors such as members of the Syphidae and Musidae families (Diptera). Also, as the study population occurs in its natural habitat and without anthropogenic influence, other species of floral visitors were recorded, for example, *Pararge xiphia* (Lepidoptera: Satyridae). Although other authors report the bird *Sylvia atricapilla* (L.) (Syllviidae), no visits by birds were observed in this study. The results and their implications for the conservation of *M. wollastonii* are discussed.

P21
New records of native vascular plants from Cabo Verde Islands

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The fieldwork carried out in Cabo Verde during the last few years by the authors and collaborators allowed an advance in the knowledge of the distribution of the flora in this archipelago. New data for three native pteridophytes and four endemic angiosperms were recorded on the islands of Santa Luzia, São Vicente, São Nicolau, Santiago, and Fogo. Between 2010 and 2022, a new population of *Actiniopteris radiata* (Pteridaceae) was reported for the first time for Santiago, increasing the distribution of this species previously known only for the islands of São Nicolau, Santo Antão and Fogo. *Asplenium hemionitis* (Aspleniaceae), a rare species, was observed, for the first time in 2000, in Monte Gordo (São Nicolau); the presence of this population was reconfirmed in 2010. Also, on Fogo and Brava islands, the presence of this species was reconfirmed in 2022. *Asplenium adiantum-nigrum* (Aspleniaceae), a rare species known only for Fogo, where it was recorded by Lobin in 1998, was reconfirmed in the volcano area, at 2800 m in 2021. Over 100 individuals from the endemic species *Frankenia pseudoericifolia* (Frankeniaceae) were reported for Santiago Island, now known for all the islands. Over 1000 individuals of *Frankenia caboverdeana*, over 200 individuals of *Kickxia dichondrifolia* (Scrophulariaceae) and over 10000 individuals of *Tetraena vicentina* (Zygophyllaceae)

were reported for the first time in Santa Luzia. Two new populations of *Euphorbia tuckeyana* (Euphorbiaceae) of 100 individuals and two new populations of *Cynanchum daltonii* (Apocynaceae) were recorded in Santa Luzia. In addition, recent field surveys indicated that the endangered endemic tree *Sideroxylon marginatum* (Sapotaceae) is more abundant in Santiago and Fogo islands, where six populations were recently found. The total population of this species increased from 500 to over one 1000 individuals in Santiago. Moreover, new populations with over 20000 individuals of *Asparagus squarrosus* (Asparagaceae) were found in Santa Luzia.

P22
Distribution and population genetic diversity of *Goodyera macrophylla* Lowe, an endemic orchid to Madeira Island (Portugal)

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Orchidaceae are represented in Macaronesia by a scarce number of taxa (18), although it has a very high endemicity, including 9 taxa endemic to one archipelago. In the Madeira archipelago 5 orchids are currently recognized: *Dactylorhiza foliosa* (Sol. ex Lowe) Soó (endemic to Madeira Island), *Gennaria diphylla* (Link) Parl. (native in all islands), *Goodyera macrophylla* Lowe (endemic to Madeira Island), *Neotinea maculata* (Desf.) Stearn (native in Madeira Island) and *Orchis scopulorum* Summerh. (endemic to Madeira Island). The genus *Goodyera* R.Br. includes close to 90 species widely distributed, ranging from Asia, Northern and Central America, Europe, extending to northeast Australia, South Africa, Madagascar and the southwestern Pacific islands. Recently a Pleistocene American origin has been proposed contradicting a possible relict origin from Europe. *G. macrophylla* Lowe (Orchidaceae) is very rare, although locally abundant, nemoral hemicryptophyte that occurs in forest clearings or ravines in the stink-laurel forest (*Clethro arboreae-Ocoteetum foetentis*) between 300 and 1300 (1400) m a.s.l. in North face of Madeira Island. *G. macrophylla* has a very restricted area of distribution for habitats associated with *Ocotea foetens* dominated forests. This species has creeping branching rhizomes forming dense aggregates, ovate to lanceolate or narrowly elliptic leaves up to 20(25) cm long and spikes with 25 to 80 flowers. *G. macrophylla* has been evaluated as "Critically Endangered" by the IUCN, although with a stable population trend. In all populations found, the plants were individually georeferenced using a GPS and a new distribution map of *G. macrophylla* is presented. Simultaneously, leaves were collected from a representative sample of each population to obtain DNA, in order to estimate genetic diversity and population differentiation using regions of the genome flanking microsatellite sequences (ISSR markers). Preliminary results are based on 16 (out of 34) populations and 46 (out of 266) individuals. Inter and intra-population diversity, including the effect of clonality on population genetic diversity patterns are discussed including possible implications on *in situ* and *ex situ* conservation actions.

P23
Exploring the diversity of Canarian vascular plants in the herbaria of the world

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Natural History collections represent a scientific and heritage resource of the utmost importance, allowing science to be revised and verifiable. Herbaria are the Natural History collections essential to advance in all Plant Sciences, including Botany. The exploration of data on Canarian vascular plants in the major herbaria worldwide offers disparate results depending on the degree of digitalization and on the data offered, directly or through GBIF. The main Canarian herbaria (LPA, ORT and TFC) keeps about 135000 specimens, which represent, both together and separately, the best collection of the Canarian plant diversity. This has been roughly estimated by experts in these collections - managers or curators - due to their low digitization rate. The herbaria of the Iberian Peninsula keep, according to GBIF, about 5800 specimens, with the largest collections in Madrid (MA) and Barcelona (BCN). An estimated number of 15000 specimens could be reached using original herbaria data in a complete digitalization scenario. The European herbaria - American and Asian herbaria have residual values - follow a similar pattern, with values according to GBIF close to 10000 specimens and with the best representation in Naturalis (L) and Oslo (O). European collections are generally scarcely digitalised, which prevents us from having a total estimated value. The collection of plants and digitalization of Canarian specimens in herbaria are the best tool to know the plant diversity of this area, allowing to guarantee the advancement of knowledge of the flora of the Canary Islands, for the present and for the future.

P24
Madeira and Desertas Islands from the perspective of a 19th century botanist. The correspondence exchanged between J. F. Lippold and W. J. Hooker

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Johann F. Lippold (fl. 1824–1840) was a German botanist who visited Madeira and Desertas Islands between 1837 and 1840 to collect plants and other objects of natural history, offering amateur naturalists the possibility of receiving specimens for a subscription of £5. Recommended by their common friend William Jackson Hooker, Lippold was received by Richard Thomas Lowe, an Anglican clergyman and naturalist who lived in Madeira, who assisted him in his journeys. Lippold was described as a "good-natured, fast-paced and strong man and an indefatigable collector". Little is known about this elusive character, since information relating to his life is fragmentary and dispersed.

Nevertheless, a set of four long letters sent by Lippold to Hooker from Funchal, and kept at the Royal Botanic Garden, Kew's Library and Archives, offer a glimpse to the work carried out by Lippold. We present a synthesis of such information, particularly focused on Lippold's remarks on the flora and landscape of these islands, assembled from these letters and from published sources, both from Lippold and from William Hooker. Lippold's herbarium specimens, kept at the Natural History Museum Herbarium, in London (BM), were also taken as sources of information. Lippold's letters illustrate the relations between local botanist R.T. Lowe and visitor botanists in the process of discovering and collecting the islands' flora. Comments on the landscapes of Madeira and, mostly, of Desertas, and on the findings of possible new species are of particular importance. Reports on rare endemic species (such as *Teucrium heterophyllum*, *Goodyera macrophylla*, *Normania triphylla* and *Olea maderensis*, among others) and of the envoy of live specimens to England, as well as details on the land use of Desertas, constitute a rare document on the ecology and plant diversity of Madeira archipelago.

P25

A preliminary account on the history, phylogeny, reproductive biology, distribution, and genetic diversity of the Madeiran endemic *Pittosporum coriaceum* (Pittosporaceae)

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Genus *Pittosporum* Banks ex Gaertn. includes about 200 species of paleotropical distribution, ranging from Australasia, Oceania, Eastern Asia and the Arabian Peninsula to some parts of Africa (e.g. Ethiopia, South Africa). *Pittosporum coriaceum* Dryand. ex Aiton, known locally as 'mocano', is a strict endemic of Madeira Island, in the North-eastern Atlantic Ocean, and corresponds to the sole Pittosporaceae in Europe and Macaronesia. *P. coriaceum* is a 5-8 (10) m tall evergreen tree, with smooth light-grey bark; leaves are leathery, glabrous, ovate to oblong-ovate and obtuse; flowers are small, grouped in corymbs, white-yellowish, and strong-scented; fruits are ovoid apiculate woody capsules, up to two centimetres long, dark-brown when ripe. The ecological optimum of *P. coriaceum* lies within the zonal belt of the stink-laurel (*Ocotea foetens*) evergreen temperate forest, often in steep inaccessible rock walls and outcrops. As only a few fragmented populations are known, summing up 40 to 50 individuals in total, we estimate the UICN threat category of the *P. coriaceum* metapopulation—although stable—to be *CR - Critically Endangered*. The main current threats are wildfires, landslides, reproductive impairment, and genetic erosion. We present data on historical descriptions and cultivation accounts following the publication of its first illustration in 1802. Maps of estimated historical and actual distribution and up-to-date counts of individuals are also presented. In each population, simple repeat DNA samples of microsatellite regions (ISSR) were taken from all individuals to evaluate genetic diversity. Moreover, by means of chloroplast markers (matK, psbA-trnH gene spacer, rbcL), the phylogenetic position of *P. coriaceum* within the genus was inferred. Finally, also accounting for new data gathered on the

species' floral and reproductive biology, we discuss our results envisaging both *in-* and *ex-situ* conservation of *P. coriaceum*.

P26
C.L. Champion Mycetozoa collection in TFC Herbarium

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Invasive alien species are one of the main causes of global biodiversity loss. Its negative effects include ecological and economic aspects, ecosystem services, and human health. Invasive species especially threaten island ecosystems and their endemic biota. For all these reasons, it is compelling the development of plans for the control and eradication of invasive species, requiring for that a deep knowledge of the ecology of these species is essential. The main objective of this project is to reveal the population dynamics and the ecological ranges of three grasses: *Pennisetum setaceum* (Forssk.) Chiov., *Melinis repens* (Willd.) Zizka and *Setaria parviflora* (Poir.) Kerguelen. These species have different distributions in the Canary Islands and are probably in different phases of invasion. Through this project, focused on Tenerife, we will try to understand its colonising success and thus be able to determine its dispersion capacity under different environmental conditions. The project covers different ecological aspects: study of the population dynamics of the three species, potential distribution, impact on plant communities, determination of their plasticity based on different environmental factors and analysis of the anthropogenic factors that affect their dispersion, as well as social aspects as risk perception through social analyses. These specific objectives will be achieved through the development of experiments in the field, greenhouse and germination chambers, as well as conducting surveys, interviews and literature searches. As results, we hope to generate a current potential distribution model for the species and a general invasion model. Likewise, we will develop multivariate models including the ecological, geographical and social characteristics of the species in order to analyse what factors determine the vitality and dispersion of the populations. Finally, a manual with technical proposals for the control and eradication of these exotic species will be published with all the results.

P27
First results on the monitoring of three endemic plant taxa of the Madeira archipelago, *Marcetella maderensis*, *Chamaemeles coriacea* and *Berberis maderensis*

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This poster summarizes the results obtained by the project "Conservation of Forest Genetic Resources in Madeira" (REGIS, 2019-2023), in what concerns the distribution of populations and conservation actions carried out in three target species: *Marcetella maderensis* (Bornm.) Svent. (Rosaceae), *Chamaemeles coriacea* Lindl. (Rosaceae) and

Berberis maderensis Lowe, (Berberidaceae). *Marcetella maderensis* is a Madeira Island evergreen endemic dioecious shrub up to two meters, found in scattered, and scarce populations on the north and south coastal ravines, on Mediterranean rock outcrops. According to the IUCN, this species is considered Endangered. *Chamaemeles* is a monotypic Madeira archipelago endemic genus. *Chamaemeles coriacea* (buxo-da-rocha) is an evergreen tall shrub, up to 4 m, characteristic of the Madeira oleaster micro-forest (*Mayteno umbellatae-Oleetum maderensis*). According to the IUCN, this species is considered endangered. *Berberis maderensis* (fustete) is a Madeira Island endemic. It is an evergreen shrub with prickly and reddish stems, found in the high-altitude heath series (*Polysticho falcinelli-Erico arboreae sigmetum*), close to the limits of the high-altitude rocky cliffs vegetation of the central massif of the island of Madeira. According to the IUCN, is critically endangered. As part of the project, field work was carried out to assess populations and detect possible new nuclei of these taxa. Here we present an update distribution, and new data on the ecological characterization of *M. maderensis*, *C. coriacea* and *B. maderensis*. As part of the ecological and habitat characterization for each population threats were described, and major threats related to habitat degradation due to the long-lasting effects of past landscape use were detected, including competition with invasive plants as well as others associated with changes in habitat abiotic factors.

P28

NEXTGENDEM: Biotic, abiotic and geospatial data to improve the management of species and spaces in Macaronesia

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NEXTGENDEM (MAC2/4.6d/236, https://www.nextgendem.eu/) is an ongoing research project aimed at creating an analytical framework for multiple biotic and abiotic data layers associated with the Macaronesian endemic floras and their distribution areas. In this poster, we present the structure of the analytical pipelines that we are streamlining to carry out multi-variable analyses with geographic, territorial, ecological, climatic, reproductive, molecular, morphological and other data. Thanks to the samples resident at the DNA Bank of the JBCVC-UACSIC, the system will also allow to approach the taxonomic ID and geographic origin of Canarian or Cape Verdean samples using the official barcode sequences (*rbcL* and *matK*), and to reconstruct dated phylogenies with at least these two cpDNA regions and, increasingly, with genomic data. Following HPCaaS philosophy, most calculations will be carried out through a web application where users can transparently submit jobs to supercomputing resources provided for (and integrated with) the NEXTGENDEM platform, currently CIPRES and Teide, and foreseeably to other

resources, like the Spanish supercomputing network. Our overarching objective is to organise, enrich and analyse the most updated knowledge on Macaronesian floras to facilitate their science-based conservation through the integrated analysis of multiple data layers, starting with the islands of Gran Canaria (Canary Islands) and Santiago (Cape Verde). The project will foreseeably include other islands and territories in the future and connect with the Biodiversity Data Bank of the Canary Islands Government (BIOTA, https://www.biodiversidadcanarias.es/biota/), with the *Demiurge* information system for genetic diversity data (http://www.demiurge-project.org/), and with other data portals that may contain complementary data and are keen to collaborate.

P29

Rugulopteryx okamurae: an exceptional case of bioinvasion by a marine macroalga in the Azores (NE Atlantic)

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The non-indigenous brown macroalga *Rugulopteryx okamurae* (E.Y. Dawson) I.K. Hwang, W.J. Lee & H.S. Kim, which is native to the temperate Northwest Pacific (in particular, Japan and Korea), was reported for the first time in European waters in 2002, in the coastal lagoon of Thau (France). Over the last two decades, the species has expanded massively throughout the Strait of Gibraltar and across the Mediterranean coasts of France, Spain, and Morocco, causing considerable ecological impacts on coastal communities. In 2019, the species was recorded for the first time in the north-eastern Atlantic archipelago of the Azores close to one of the largest harbors (Ponta Delgada, São Miguel Island). As in other places, the alga quickly proliferated and over a period of only two years it became the dominant species covering most of the rocky bottom along the south coast of the island, producing substantial accumulations and decomposition of algal wrack on coastal areas. The species has also expanded to other islands where is now well-established. Here, we show the distribution timeline of *R. okamurae* on the archipelago of the Azores, highlight its impacts on the structure of shallow water marine benthic communities, and discuss potential preventive measures and mitigation actions that can be applied to safeguard coastal marine habitats in the Azores.

P30

Improving the knowledge of threatened plant populations on Santiago Island (Cape Verde)

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The NEXTGENDEM project (MAC2/4.6d/236) aims to interpret the genetic and phylogenetic diversity of the Macaronesian floras with the help of a number of other biotic, ecological and geographical variables within the 500 x 500 m the spatial grids of the island territories studied, and to apply the resulting knowledge to the management and conservation of insular spaces and species. It complements genetic, taxonomic, reproductive, ecological, geographic and computational lines of work, in order to help take appropriate decisions based on the most updated scientific data. An important part of the project is the fieldwork under way on Santiago Island (Cape Verde), which implies the sampling and herborization of all Cape Verdean endemics known on the island. Following the survey of the known populations of each taxon, we associate the georeferenced collection of diverse samples (leaves for DNA isolation and banking, and seeds and vouchers to be deposited in the seed banks and herbaria of the participating institutions) with the ecological, taxonomic, geological, climatic and geographical features of their distribution areas, thus contributing to increase the available knowledge of this island's endemic flora. The overarching aim of this work is to improve the knowledge and conservation status of the plant biodiversity of around 40 endemic species on the island of Santiago through different actions, thereby consolidating the Macaronesian transnational cooperation network of biological sample and data banks established in past projects. The resulting data will also be incorporated in the geographical information system developed by NEXTGENDEM and to the BIOTA data repository on Macaronesian biodiversity (https://www.biodiversidadcanarias.es/biota/).

P31

The Gran Canaria Biosphere Reserve as a model of the applicability of Phylogenetic Diversity to help set conservation priorities for oceanic island floras

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In the current context of unprecedented biodiversity loss, several international agreements have emphasized the importance of safeguarding all the dimensions of biodiversity: ecosystems, habitats, species, and, especially in the last decades, genetic diversity. Multidisciplinary scientific data are crucial to increase the current knowledge of biodiversity that we aim to protect. Here, we estimate the phylogenetic diversity (PD) and phylogenetic endemism (PE) of the 227 endemic plant taxa currently distributed in the 724 grids of 1 km2 in which the terrestrial part of the Gran Canaria Biosphere Reserve (GCBR) was compartmentalized, and compare the patterns obtained with other relevant biodiversity indicators, e.g. species richness (SR) and weighted endemism (WE). Categorical Analyses of Neo- and Paleo-Endemism (CANAPE) were also performed. Our main goal is to help to define the best strategy for the management and conservation of the rich, complex and extremely fragile flora of this part of Gran Canaria. Although the SR and PD values obtained for the GCBR's endemic flora are not significantly different, the resolution provided by PD estimates was superior. The northern and central areas of the GCBR stood out as evolutionarily important as they both show an accumulation of ancestral diversity (paleo-endemism following CANAPE results) and an area where speciation is still in action

(neo-endemism). These together with other areas in the East pinpointed as highly diverse, should be considered as priorities for conservation, especially since they are not included in any protected area nor in the core zones of the GCBR. Alongside other biotic and abiotic indicators (e.g. ecological, climatic, geographical), these results should contribute to a better conservation and management of the biodiversity in this complex part of Gran Canaria, with potential implications for other oceanic archipelagoes.

P32

Testing Darwin's pre-adaptation hypothesis in Canarian angiosperms

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In Charles Darwin's seminal book *On the Origin of Species* it was acknowledged that close relatedness to native species could confer an advantage to newly arrived species due to similar adaptive potential to the environment. This has been termed as the 'pre-adaptation hypothesis' and is closely related to the ‘niche conservatism’ concept, where closely related species tend to have similar ecological requirements. In this study, we seek to test this hypothesis using a set of congeneric co-occurring vascular plant species in the Canaries. Through a climatic envelope approach, we aim to evaluate to what extent do aliens benefit from their congeneric relationship to Canarian native species and if the niche conservatism hypothesis is a plausible explanation. For this, we selected 93 species from 14 angiosperm genera where exotic and native species occur across the archipelago. Using high-spatial resolution climate data, we calculated climate envelopes and compared native vs. exotic taxa through a niche similarity test. We noticed that exotic species of cultivated origin show climatic niche divergence with native sister taxa, ranging from none to only weak evidence of climatic niche similarities. In the case of complex speciose genera, similarities depend mostly on the closeness to the extant native congeners. We conclude that no strong evidence of niche similarity can still be advantageous to congeneric taxa while niche conservatism in incipient radiating lineages can still be at play. Overall, understanding the intricacy of niche conservatism to explain the niche pre-adaptation hypothesis is subject to the nuances of each group.

P33

Aerial roots of the Macaronesian Dragon tree (*Dracaena draco*): gaps and controversies

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The aerial roots (AR) of *Dracaena draco* L. (Asparagaceae) or 'Macaronesian dragon tree', are generally shown as vestigial organs, whose function is not well understood. Normally, AR are rare and occasional, and their occurrence depends on natural factors, primarily pathological but without ruling out genetic or developmental agents. In *D. draco* subsp. *draco*, AR usually arise at the base of the branches, but many individuals never develop them. In *D. draco* subsp. *caboverdeana* are more frequent and naturally arise along the

branches. In *D. tamaranae* they have not been observed. AR associated with certain pathologies can emerge from any part of branches, trunks, or the underground root system. In cultivated plants with a good water supply, AR can arise at the base of the primary branches, they sheath the trunk and can reach the ground, with a clear function of support and anchorage, but this is exceptional. In other cases, AR role in the absorption, transport, or storage of water, the exchange of gases, photosynthesis, and storage of assimilated products has been suggested, but the AR role in vegetative reproduction is controversial. In most cases, the emergence of AR is associated with pathological causes: infections, pests, mechanical damage, rotting root system by contaminated water, etc. In the years 2008-2009, the intensive appearance of AR was noticed in dragon trees growing in the Jardín Botánico Canario "Viera y Clavijo" (Gran Canaria), and this is currently recorded on several islands. The cause of AR origin is unknown but in many cases is lethal for dragon trees. We do not rule out a possible viral invasion. The explanation of the cause-and-effect relationship in the AR formation by dragon trees has a crucial meaning in the understanding of the growth and functioning of this endangered species.

P34
RedEXOS, the early warning network of the Canary Islands for the detection and intervention of invasive alien species

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RedEXOS is the official Early Warning Network of the Government of the Canary Islands for the prevention of establishment of new outbreaks or populations of invasive alien species (IAS) or those with invasive potential in the Canary Archipelago. Biological invasions on islands have become a major driver of biodiversity loss since isolated biotas are more sensitive to alien species. In this context, RedEXOS is articulated as a network or early detection of IAS, with citizen collaboration being a fundamental backbone for its achievement. RedEXOS' working group is constituted through different collaborating Administrations involved in IAS management, nature conservation research institutions, external specialists, and non-governmental organizations within the environmental sector. RedEXOS has developed a platform, consisting of an App and a website, designed to collect and coordinate information on the sightings of exotic species in the Canary Islands. The novelty of this platform as opposed to other similar platforms is the development of two approaches that can interact with each other: a technical one, directed to specialized profiles in IAS management, and another focused on citizen science reporting. Reports made through RedEXOS platform are validated by an expert taxonomist. Contact can be made with particular users through RedEXOS' App chat feature. This direct communication channel allows to obtain verified information such as taxon or location. When RedEXOS intervention team acts upon an early warning sighting, a report is sent back to the user with information on actions taken. Early detection and intervention of IAS in new locations and areas of high ecological value has been proven to be more efficient economically and in regard to invasive species successful eradication. RedEXOS platform currently has more than 1,500 registered users, with more than 400 different taxa reported and more than 7,000 validated reports, of which more than half correspond to interventions on IAS.

P35
Processes and patterns of extinction in the flora of Macaronesia

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The number of studies on plant extinction patterns have so far been very limited compared to other taxonomic groups. These studies generally reveal relatively low extinction rates. However, high extinction debt, together with the lack of exhaustive studies, could have led to an underestimation of the magnitude of the problem. In this context, islands are particularly important environments as they are home to numerous endemic species, which contribute significantly to global biodiversity and which, besides, are particularly vulnerable to disappearing. We carry out an exhaustive review of the extinction and extirpation events that have occurred in the Macaronesian flora. Specifically, we analyze which geographic and biological factors influence the risk of extinction, as well as analyze the existence of temporal-altitudinal patterns of extinction, linked to socioeconomic changes occurred on the islands. According to our predictions, local extinctions, especially of archipelagic endemisms, were significantly predominant. This was even more notable in taxa linked to open habitats. In addition, we show the existence of significantly frequent characteristics among extinct taxa, such as the herbaceous habit, hemicryptophyte lifeform, monoecy, entomophilous pollination or anemochoric dispersion. We identified the existence of differentiated patterns of extinction in the altitudinal gradient over time, highlighting a recent coastal nucleus associated with tourism development. Through this work, the need to increase knowledge about the functional traits of the Macaronesian flora is highlighted to predict possible future extinction events more efficiently and accurately.

P36
Current status of invasive alien vegetal species in Fuerteventura (Canary Islands)

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An evaluation and prioritization (qualitative and quantitative) of invasive alien species (IAS) or potentially invasive species has been carried out on the island of Fuerteventura, from the perspective of focusing efforts on prevention and early warning (eradication of

new focus and containment). A catalog of IAS or potentially invasive species for the island has been elaborated and a management requirement card with useful information prepared for each taxon. We have identified their main introduction pathways and the most relevant impacts on their habitats of interest. The prioritization carried out does not provide a single priority list, but aims to provide flexible lists to suit different, clear, and achievable management objectives. These lists should be susceptible to future changes, unavoidable due to the rapidly changing dynamics of this problem. This study, financed by the Government of the Canary Islands, and framed within the actions carried out by RedEXOS (Red de Alerta Temprana de Canarias) contributes to building collaboration channels between the different administrations. This is necessary to achieve actions with a high possibility of success, follow actions performed so far with several species in an effective way, and increase the number of taxa managed based on existing resources.

P37

Carbon storage of *Euphorbia balsamifera* on the island of Tenerife, Canary Islands

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Euphorbia balsamifera is the dominant species in the vegetation community of "tabaibal dulce" or sweet spurge scrub. It is accompanied by other relevant species such as *Schizogyne sericea*, *Plocama pendula* or *Kleinia neriifolia.* This scrub ecosystem is well represented in the Canary Islands, contributing with a significant amount of biomass and therefore having a role in the reduction and compensation of the carbon footprint. The main objective of this work is to estimate the biomass and the carbon content stored by *E. balsamifera* in the sweet spurge scrub on the island of Tenerife. We studied the coverage of *E. balsamifera* within the sweet spurge scrub. We set up 15 plots on the island of Tenerife considering different elevations to get a good characterization of the community throughout its distribution. Our data show that *E. balsamifera* has on average, a 35% of coverage within this plant community. We then estimated the aerial biomass of *E. balsamifera* per unit area. In total, 21 individuals with different sizes and morphologies were cut off in well preserved areas of sweet spurge scrub. Additionally, we measured volumetric data from each individual. Biomass per unit area and plant coverage were then used to estimate the total amount of carbon stored by *E. balsamifera* on Tenerife. Finally, we developed an allometric equation to estimate the aerial biomass (fresh and dry) for the species from morphometric data, to avoid the use of destructive methods when estimating biomass in future research. This study showed the contribution of *E. balsamifera* on carbon storage of the Canarian coastal vegetation and will be useful for future management measures aiming to offset the carbon footprint of Tenerife.

P38

IV inventory of flora of La Caldera de Taburiente National Park: GIS applied to field data collection

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The methodology used to carry out the IV Inventory of flora and vegetation and monitoring of natural resources (2021-23) in La Caldera de Taburiente National Park, located in the northern centre of the island of La Palma, Canary Islands, is presented. This inventory seeks to know the richness of plant species and their distribution in this protected area. It was carried out for the first time in 1992/93 and is repeated every 10 years, making it a first-class long-term study. The public company TRAGSATEC has executed the next two inventories (2002/03 and 2011/13) and is currently developing the fourth one (2021/23). The methodologies used have been changing and improving throughout this period. Currently, ArcGIS PRO GIS, cloud based ARCGIS ONLINE software and its FieldMaps mobile application are being used. This has allowed the integration of data from multiple sources in the same platform, facilitating its visualization and optimizing field data collection. The information used includes data from previously National Park inventories and from the Banco de Datos de Biodiversidad de Canarias, basic topographies, orthophotos, among others. On top of this, there are the data collection layers, and their corresponding related tables. The availability of consulting previous information without an Internet connection, the speed of data collection and the synchronization with an online server for subsequent data analysis, improve both the quality and performance of this type of project, which requires a large amount of data to be recorded in the field.

P39
Citizen Science in the Azores: the iNaturalist project "Flora of the Azores"

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The iNaturalist (iNat) platform of California Academy of Sciences and National Geographic is a Citizen Science tool for identification of organisms and easy data collection. iNat is democratic, everybody can participate, no matter what academic background or status someone has. iNat is fair, everybody gets full credit for her/his observations, full access to all observations, and equal rights to confirm or reject identifications. Finally, iNat is precise and verifiable since observations come with geographic coordinates and photographs. In 2021, we started a "Flora of the Azores" project on iNat for Azorean observations of wild vascular plants and bryophytes (www.inaturalist.org/projects/flora-of-the-azores). Since then, about 10.000 observations by >600 observers belonging to >800 species have accumulated. Of these, 80-90% are "research grade", which means they have been confirmed by other identifiers. About half of the observations belong to introduced plants, including *Hedychium gardnerianum*, the most frequently reported species with > 250 observations. Other invaders in the top ten are *Pittosporum undulatum* (135), *Persicaria capitata* (125), *Hydrangea macrophylla* (124), *Cryptomeria japonica* (107), and *Cyrtomium falcatum* (106). Among the native species, the most frequently reported are *Erica azorica* (188), *Azorina vidalii* (134), *Morella faya* (110), and *Selaginella kraussiana* (108). This reflects mostly the abundance and wide distribution range but in the case of *Azorina* also the attractiveness of an uncommon species. With increasing number of records, quality of automatic identification via image analysis and 'nearby observations' has improved dramatically. Thus, it is now possible to identify many species automatically with just one or two photographs. However, while

identification rates for flowering plants are impressive, for ferns they are lower, and bryophyte observations rarely reach species level. This is unlikely to improve since citizen scientists cannot provide microscopic details required for reliable identification of bryophytes. In conclusion, the project delivers high-quality distribution data for flowering plants but its use for bryophytes seems limited.

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Development of an allometric equation to estimate the carbon storage in *Plocama pendula* Aiton

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Understanding the contribution of different species to the carbon sequestration in the current climate crisis could guide conservation plans in different ecosystems to mitigate human carbon emissions. The Canaries are a particular case because of their biodiversity and the uniqueness of the flora, so it is necessary to carry out specific studies for most species. *Plocama pendula* (known as balo) can be found in the coastal scrubland in the island of Tenerife, an ecosystem characterised by shrubs and herbs adapted to dry and warm conditions. Within the coastal scrubland, P. pendula can be found in different vegetation communities such as baleras (the community dominated by P. pendula itself) and the tabaibal dulce (the coastal scrubland dominated by *Euphorbia balsamifera*). The aim of this study is to construct an allometric equation to estimate the dry biomass of *P. pendula* individuals from their volumetric data. For developing this equation, 18 individuals of P. pendula were cut off in different sites within Natural Protected Areas of Tenerife. In the field, we measured the fresh weight, and, in the laboratory, the dry weight by drying the samples in the oven. Sampled individuals had different sizes to try to obtain the whole variability within the species. We also took volumetric variables, two main diameters and height, phenology and vitality of each individual. In the laboratory, the woody part was separated from the photosynthetic part, to obtain the ratio and their percentage of water content for the species. With the dry weight of each individual and the volumetric variables we created an allometric equation for the species. This equation can be used to estimate biomass for each individual of the species in a certain area, thus making the destructive method of cutting the individual no longer necessary. This research is part of an ongoing project financed by the Canarian government that will assess the Canarian ecosystem capacity to capture and store atmospheric carbon.

P41

Does fitness of *Cenchrus setaceus* modulate germination?

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Fountain-grass, *Cenchrus setaceus* (Forssk.) Morrone (syn. *Pennisetum setaceum* (Forssk.) Chiov.), is an invasive species which greatly expands in Tenerife, Gran Canaria and La Palma, outcompeting endemic flora. In the last years, across islands, weaken plants with symptoms like stunting, chlorosis and browning of leaves, leafspots and blackened leaves

have been observed. However, the drivers of these signs are unknown. Likewise, the evolution and expansion of these symptoms to other populations, or the effects on the germination capacity are veiled. To fill the gap in these questions, we developed a study in 24 plots covering different environmental conditions in Tenerife (Canary Islands). We monitored 50 individuals per plot in the dry and the wet season. Plant overall parameters like i) phenology, ii) size range (plant volume), iii) plant health status (symptoms presence and scale) and iv) number and health status of inflorescences were recorded. Differences in fitness of the plants were found among plots but not between zones (north and south) with bigger plants more affected than smaller ones and the health status weakening after 8 months (Tukey, $p<0.05$). To determine the effect of the plant fitness on the germination capacity, ten healthy and ten weakened individuals were selected in five plots per zone. Similar metrics were recorded adding fecundity parameters like number of inflorescences, flowers, seeds, and floral stem length. We sampled mature inflorescences and tested germination capacity of 100 seeds per health status and plot in growth chambers. Seeds of affected plants in the south germinated slower and in lower number than the healthy ones in the same area or the north ones, irrespective of their health status (Tukey, $p<0.0$). Dry conditions of the south may contribute to the weakness of individuals, lowering the germination capacity. These results are valuable to prioritize management strategies for the control of fountain-grass. This work is part of the project "Nuevas técnicas de control del rabogato, *Pennisetum setaceum*", funded by Consejería de Transición Ecológica, Lucha contra el Cambio Climático y Planificación Territorial, Gobierno de Canarias.

Symposium participants