EMAPi 2023

16TH International Conference on Ecology and Management of Alien Plant Invasions

Promoting diversity in the science and management of biological invasions

Book of abstracts

IEB INSTITUTO DE ECOLOGÍA & BIODIVERSIDAD

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Welcome Message

Dear EMAPi2023 participants,
We would like to give you a warm welcome to Pucón, Chile where we will be hosting the 16TH International Conference on Ecology and Management of Alien Plant Invasions. This conference has a long tradition that started in 1992 in Loughborough, UK and has been held regularly since that time in multiple continents. The last EMAPi was help in Prague in 2019, and after, the delays caused by the terrible pandemic of COVID-19, we are now extremely happy to see we have been able to gather this wonderful group of scientists and managers. We have tried our best to fulfill our motto "Promoting diversity in the science and management of biological invasions", welcoming more than 130 people from 35 countries to the meeting (please see our Code of Conduct). During this week, we will be discussing the main trends, advances, and challenges in our discipline, and their direct implications for reducing the threat posed by invasive alien plants to nature and people.

2023 has been an important year for invasive alien species globally but especially for Chile. The new Kunming-Montreal 2030 Global Biodiversity Frameworks of the Convention of Biological Diversity, and in specific its Target 6 calls for strong actions to halt biological invasions. Just in the past month, the IPBES Invasive Alien Species Assessment report was launched, and its results are now being discussed in academia but more importantly by policy makers across the world. Media attention to this report has sparked unprecedented public interest in the issue and we have now an opportunity to promote policy actions in our countries. In Chile, we also have positive advances to report. The new Service of Biodiversity and Protected Areas has finally been approved and will be the first government agency with clear attributions to regulate and control invasive alien species.

Of course, besides the heightened awareness on the problem of invasive alien species and all these encouraging news, still much needs to be done in the science, policy, and management of biological invasions. We are sure that the discussions we will be having this week will help to achieve this goal and we will all come back home with a stronger commitment to address biological invasions and promote the dialogue between science and society.

Finally, we want to make sure you take advantage of the fabulous setting of Pucón and its surroundings, where you will be able to connect with the amazing biodiversity, geology and cultural heritage of south-central Chile. Please remember to post all your stories in social networks with the #EMAPI2023 and join our Slack channel in https://join.slack.com/t/emapi2023/shared_invite/zt-254x9t20l-js1C_n_wJCincS2ObOxIZg

Enjoy EMAPi2023

Welcome to Pucón and thanks for coming!

Organizing Committee

Instructions for Presenters

Authors won't be allowed to use their own notebooks for presentations. For oral and flash talk presentations, a notebook will be available at the registration desk. Please upload your presentation as soon as possible. Please specify your preferred file type and provide a PDF version as a backup. Save the file with the first author's last name. If you don't have a memory stick (USB drive), the organization can provide one.

As second option, there will be a notebook available in the session room for you to upload your presentation. All presentations should be uploaded before the corresponding session begins.

For oral presentations, each presentation should be 15 minutes in length, consisting of a 12-minute presentation followed by a 3-minute question and answer session. You are welcome to adopt any presentation style of your choice.

Flash talks consist of two components. First, there is a 5-minute oral presentation where authors can emphasize the most crucial aspects of their research. Second, authors are expected to present a poster during the general poster session.

For posters, please make sure you know your panel number as indicated in the program and hang your poster before 9:30 AM on the day you have been assigned. The organization will provide any necessary materials. All posters should be removed each day after the poster session.

Each oral presentation and flash talk session will be facilitated by a moderator. They will launch each session, present each author, and manage timing for presentations and the corresponding Q&A session.

Code of Conduct

As EMAPI023 motto "Promoting diversity in the science and management of biological invasions" says, as Organizing committee, we would like to ask all participants of this year conference to respect all conference participants, regardless of their background. We want to encourage an inclusive and welcoming environment for everyone.

We want to provide a Harassment-Free Environment and will have a zero-tolerance policy for any form of harassment, including but not limited to, verbal, physical, or visual harassment, discrimination, and unwelcome advances. If you are victim of any kind of harassment, or feel you are being disrespected, please approach the organization committee and report, even personally or via email (emapi2023@gmail.com). Anonymity will be respected if desired.

This code of conduct applies to all conference participants, including but not limited to attendees, speakers, organizers, volunteers, and sponsors. We expect everyone to behave correctly in public spaces, both physical and virtual, including social media. It also relates to any activities within the organization of this conference, including

presentation sessions, lunches, coffee breaks, dinner, field trips and workshops, or any other social activities.

If you consume alcohol during any of the conference activities (welcoming reception, dinner, or poster session) please consume responsibly.

Please feel free to provide feedback at any time. You can submit feedback via email to emapi2023@gmail.com or by completing the 'Diversity Stories' form, which will help us improve this code of conduct and future conferences.

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EMAPI Board

The board is composed of past organizers of the EMAPI conferences who accepted an invitation, and it has no formal structure. For more information, read this paper by Pyšek et al. (2018) about the history of the EMAPI Conferences.

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Plenary speakers

Agustina Barros

Agustina Barros is a researcher at the National Institute of Nivology, Glaciology and Environmental Science (IANIGLA) in CONICET, Argentina. She works in the field of plant ecology and biological invasions, with a particular interest on the effects of human disturbance, including tourism and recreation, on mountain vegetation. Most of her work has been conducted in the Andes of Argentina and most recently on alpine ecosystems in Tasmania. She has published several research articles on these fields and co-edited the recently published book entitled Tourism, Recreation and Biological Invasions. She is currently the co-chair of the Mountain Invasion Research Network (MIREN).

Michele De Sá Dechoum

Michele is a professor of Ecology at the Federal University of Santa Catarina, Brazil, and the coordinator of the Lab on Ecology of Biological Invasions, Management and Conservation. She is also a collaborator of the Horus Institute for Development and Environmental Conservation, in which she coordinates a volunteer program for the restoration of coastal ecosystems. Their research is focused on three main goals: to assess key factors related to biological invasions in (sub)tropical ecosystems; to identify impacts generated by invasive species; and to assess the effect of management in invaded communities and on the restoration of key ecosystem functions.

Jeff Dukes

Jeff Dukes is a senior staff scientist in the Department of Global Ecology at the Carnegie Institution for Science, and a Professor (by courtesy) in the Departments of Biology and Earth System Science at Stanford University. Dr. Dukes's research examines how plants and ecosystems respond to a changing environment, focusing on topics from invasive species to climate change. Much of his experimental work seeks to inform and improve climate models. He has been elected a Fellow and named a Public Engagement Fellow of the American Association for the Advancement of Science, and he is a Fellow of the Ecological Society of America. As the director of the Purdue Climate Change Research Center, Dr. Dukes led the Indiana Climate Change Impacts Assessment.

Ana Novoa

Ana Novoa uses an interdisciplinary approach to understand the socioecological factors influencing biological invasions and their management. She first studied biological invasions as a PhD student at the University of Vigo in Spain, and then joined the Centre of Excellence for Invasion Biology in South Africa as a Postdoctoral Fellow. Since 2017, she has been based at the Institute of Botany of the Czech Academy of Sciences. Ana Novoa serves as the Thematic Deputy Editor-in-Chief for Management of Biological Invasions and as Associate Editor for Biological Invasions and Koedoe. She also participates in several international groups, including her role as Secretary of the European Group on Biological Invasions (NeoBiota).

Martín Nuñez

Martín Nuñez is an ecologist from Argentina, currently in Houston, Texas, broadly interested in the study of biological invasions. Invasions provide the possibilities of testing many ecological and evolutionary theories, and they give the possibility of applying ecological knowledge to the management of these serious threats. Invasive species can also provide crucial information to understand and face other global challenges such as climate change. These theoretical and applied challenges are what fascinate him about the study of invasions. He has worked on many topics in invasion biology including Belowground Ecology, Forestry, and Impacts of Invasive Species.

Brian van Wilgen

Brian van Wilgen is an Emeritus professor at the Centre for Invasion Biology at Stellenbosch University, South Africa. He has over four decades of experience as an applied ecologist in southern and eastern Africa and beyond. He has published widely on the ecology and management of alien plant invasions, as well as on the ecology and management of fire-prone ecosystems. In 2020, he was the lead editor of a 1000-page, encyclopaedic book on biological invasions in South Africa, published by Springer. Brian has retired to the coastal village of Betty's Bay, South Africa, from where he continues his research work.

Workshops

Workshop: The legacy of plant invasions: identifying the drivers of changes in plant trajectories during restoration and how to manage them.

Leading organizer: Florencia Yannelli, Freie Universität Berlin

Plant invasions can have long-lasting effects on ecosystems. Even after removing invasive plants, persistent effects, known as "legacy effects," can hinder the recovery of native communities and ecosystem services. Currently, studies focus on impacts on plant diversity, competition, and interactions with belowground communities. However, there is a knowledge gap regarding the social impacts (economic, cultural, human well-being, etc.). Therefore, the workshop aims to determine what legacy effects plant invasions leave after their removal, identify key factors of these legacies, and create a framework for their management during restoration.

The workshop will be divided into three main parts: an introduction, a series of presentations, and a concluding segment that will encourage idea exchange and group discussions.

Workshop: Co-design of invasive plant management projects: lessons learned and the way forward.

Leading organizer: Michele de Sá Dechoum, Universidade Federal de Santa Catarina

Co-designed projects are planned and executed cooperatively between conservation professionals and academic researchers to achieve effective positive impacts, expanding access to resources, and fostering knowledge and experience exchange among the involved parties. This allows for maximizing the effectiveness of management and conservation efforts. Co-designed projects have significant potential to bridge the gap between knowledge and action in invasive plant management, where scientific research does not inform management actions. This workshop aims to discuss ways to foster partnerships for the implementation of successful projects on plant invasion management.

The work will be based on the discussion of shared lessons learned from previous co-designed project experiences in different countries in South America. The debate will focus on the challenges and strengths of co-design projects, particularly in the context of developing countries in the Global South.

Plenary

Plant invasions in mountain areas of the Andes: current status and the role of tourism and recreation.

Agustina Barros[1], Jonas Lembrechts[2], Sylvia Haider[3], Eduardo Fuentes-Lillo[4], María Alisa Alvarez[1], Valeria Aschero[1], Lorena de Jesus Bonjour[5], Catherine Pickering[6], Lisa Rew[7], Anibal Pauchard[4]

(1) Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales (IANIGLA), CONICET, CCT - Mendoza.
(2) Research Group Plants and Ecosystems (PLECO), University of Antwerp, Belgium.
(3) Institute of Biology / Geobotany and Botanical Garden, Martin Luther University Halle-Wittenberg, Halle (Saale), Germany.
(4) Laboratorio de Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile.
(5) Instituto Argentino de investigaciones de las Zonas Áridas, Centro Científico y Tecnológico CONICET & Universidad Nacional de Cuyo, Mendoza, Argentina.
(6) Environment Futures Research Institute and School of Environment and Sciences, Griffith University, Queensland, Australia.
(7) Land Resources & Environmental Sciences Department, Montana State University, Bozeman, MT, USA.

Mountains are known to be less susceptible to plant invasions compared to lowland environments due to the harsher climatic conditions, but this pattern is changing due to global warming and increased human use. Several human factors contribute to the spread and establishment of non-native plants in mountains, including those associated with the increased popularity of tourism and recreation worldwide. During this talk I will summarize current standardized studies developed by MIREN network assessing the role of mountain roads and trails on plant invasions globally. I will also provide examples from studies assessing how vehicles, pack animals and, even tourists themselves, act as important vectors for the unintentional introduction of non-native plants. I will provide special emphasis on observational and experimental studies conducted in the Southern Andes of Argentina and Chile, contrasting the results between mountains in the dry steppes and temperate forests. To conclude, I will discuss the social and management dimensions of mountain plant invasions, including examples from local studies assessing tourist's awareness about plant invasions and current management actions undertaken to mitigate its impacts.

Ecology and management of plant invasions for (sub)tropical ecosystem restoration.

Michele de Sá Dechoum[1]

(1) Universidade Federal de Santa Catarina, Brazil

The number of invasive non-native species and the frequency of biological invasions have been increasing over the last decades. Management interventions focused on habitat and ecosystem restoration are necessary for the conservation of biological diversity and for human well-being. In this lecture, I provide some examples of studies that our group has been developing with collaborators on factors that may explain patterns of plant invasions across the tropics and subtropics in Latin America. We have also been investigating key factors that may explain the success of introduced plant species at local scales, such as biotic interactions and abiotic factors. Understanding the magnitude of impacts caused by invasive non-native plants is necessary to define the best type of intervention for the ecological restoration of target sites. For this purpose, I present results of studies focused on impact assessment at the community level, and close with a case study in which we combined science with community engagement for the management of invasive pine trees, generating guidance for the restoration of subtropical coastal ecosystems invaded by non-native plants.

Addressing invasive species in a changing world: Does climate change matter?

Jeffrey S. Dukes[1]

(1) Carnegie Institution for Science, Stanford, California, USA

Invasive species cause ecological and economic disruption in countries around the world. Managing these species and preventing their spread is already expensive, and ongoing climate change threatens to exacerbate associated impacts and management challenges. In this talk, I'll provide an overview that examines why invasive species may be poised to become more problematic in a changing climate, and which areas are likely to be under the greatest threat. I will also discuss whether the impacts of invasive species are likely to be exacerbated by different aspects of climate change, and in which contexts. The talk will incorporate case studies, results from recent meta-analyses of experimental studies, and global analyses based on the geographic distribution of risk factors.

Unleashing the power of interdisciplinary research: the interplay of human and social factors as drivers of biological invasions.

Ana Novoa Pérez[1]

(1) Institute of Botany of the Czech Academy of Sciences, Invasion Ecology, Zámek 1, 252 43, Průhonice, Czech Republic.

Humans and society influence biological invasions in various ways. For example, humans are responsible for introducing alien species into new areas, facilitating their subsequent establishment and managing their potential impacts. Despite the significance of the human and social dimensions of biological invasions, most research in invasion science has primarily focused on ecological aspects. As a result, limited information is available on crucial human and social factors, such as public awareness and perceptions, reasons for introduction, or sources of conflicts of interest around management actions. I will provide an overview of the current knowledge regarding the human and social dimensions of biological invasions. Then, I will share insights into the overwhelming influence of these factors on the invasion process, how their knowledge can be used in studying and managing invasions, and how taking them into account can enhance our understanding of these phenomena, as well as the connections between understanding and action. I will also discuss various methods and approaches that can be employed to improve current knowledge on the human and social dimensions of biological invasions, ranging from traditional human surveys to innovative culturomic approaches. Finally, I will present several initiatives working towards increasing and promoting interdisciplinary research in invasion science. Overall, with this talk, I aim to highlight that by acknowledging the importance of the human and social dimensions of invasion science and promoting interdisciplinary research, we can obtain a more comprehensive understanding of biological invasions and develop more effective management strategies.

Keywords: Invasion science, Invasive species, Socioecological context.

The need of making invasion biology more global and inclusive.

Martin A. Nuñez[1,2]

(1) INIBIOMA, CONICET, Universidad Nacional del Comahue, Grupo de Ecología de Invasiones, Quintral 1250, San Carlos de Bariloche, Argentina
(2) University of Houston, Department of Biology and Biochemistry, TX, 77204, Houston, USA

Biological invasions are a global problem and therefore invasion science must be also global. It has become evident that most of the research on biological invasions ecological research is produced in a few (mostly wealthy) countries and many groups and regions are excluded. This imbalance in global production and visibility of knowledge limits our understanding of nature and hinders scientific advance. For example, it is not even clear which areas of the planet have move invasions. There are five main barriers to making invasion science a more global and inclusive endeavor: language, funding/ infrastructure, education/training, biases, and differences in research cultures. If we want change, we need to address these barriers through bold, coordinated actions. It is clear that one tool or action will not solve all the problems, and we need to start trying different solutions. Given the urgency of some the current invasion problems, making invasion science more global and inclusive needs to be priority.

Designing research for impact: the case of invasive Prosopis trees in eastern Africa.

Brian W. van Wilgen[1]

[1] Centre for Invasion Biology, Stellenbosch University, South Africa

In 1982, the SCOPE program on the ecology of biological invasions challenged the global research community to use scientific knowledge to develop effective ways to manage biological invasions. Much has been learnt in the intervening four decades, and yet there are few examples of truly trans-disciplinary studies that are deliberately designed to integrate research across many fields of study, as well as to involve potential end-users at all stages of the research. Such integrated studies could potentially significantly enhance the likelihood of effective implementation. This talk is about one such study (the "Woody Weeds" project), in which the ecology and management of invasive alien Prosopis trees in eastern Africa has been examined over the past seven years. Prosopis trees were introduced to Africa from the Americas to provide a suite of benefits. However, they subsequently became invasive, resulting in detrimental impacts on ecosystems and people's livelihoods. The management of Prosopis trees is complex, with no apparent simple solutions being available. Finding solutions will require integrated multi-disciplinary research approaches involving ecologists, economists, and social scientists, as well as close collaboration with the potential end-users of research findings. This talk addresses the history of introduction and spread of Prosopis trees, and how attitudes towards the species changed and diverged over time, leading to conflict. It discusses how field data were collected from the same sites, and at the same scale, across disciplines so that direct comparisons could be more easily integrated and up-scaled. It also discusses how policy-makers and potential end-users were involved at all stages of the project, and how their input helped to shape research questions. Finally, I address how this information will help to deal with this significant environmental problem.

Symposium

A risk screening of potentially invasive plant species in European-Atlantic coastal dune habitats.

D'hondt Bram[1], Tim Adriaens[1], Jasmijn Hillaert[1], Sander Carael[2], Debby Deconinck[2], Sander Devisscher[1], Indra Jacobs[1], Johannes Janssen[1], Patrik Oosterlynck[1], Reinhardt Strubbe[2], Wouter Van Gompel[1], Wouter Van Landuyt[1], Edward Vercruysse[1], Robbe Paredis[1], Toon Westra[1], Sam Provoost[1]

(1) Research Institute for Nature and Forest, Havenlaan 88/73, 1000 Brussels, Belgium
(2) Agency for Nature and Forest, Koning Albert I-laan 1-2/74, 8200 Bruges, Belgium

Atlantic coastal dune systems in Europe are vulnerable to plant invasions, a process driven by trends in urban planting, gardening and range expansion. Here, we report on a systematic risk screening performed within the framework of the LIFE DUNIAS project (LIFE20 NAT/BE/001442). We followed a data-driven approach focusing on protected habitats of the NATURA2000 framework.

We first drafted a longlist of over 1,317 alien taxa that have been observed in the Atlantic coastal region since 1950. Using the input from an international panel of experts on the perceived risks to coastal dune habitats, the list was downsized to 241 species. We then performed moderated expert assessments in a workshop format to assess the risk of introduction, establishment, spread and the (potential or realized) ecological impact for each of those species. The resulting risk scores were combined with distribution data to identify emerging (priority) species per country.

This analysis provides a habitat- and country-specific overview of (potential) invaders for coastal dune habitats in Europe. From these results, we can make recommendations on how to better deal with invasive alien species across the legislative regimes of the Habitat Directive and IAS Regulation. As such, we hope to contribute to a more harmonized approach for tackling alien species in coastal dunes across Europe's internal borders.

Keywords: risk analysis, dunes, Europe

Brazilian National Invasive Alien Species Strategy and Challenges for Implementation of Target 6 of the Kunming-Montreal Global Biodiversity Framework.

Tatiani Elisa Chapla[1]

(1) Ministry of the Environment and Climate Change of Brazil, Department of Biodiversity Conservation and Sustainable Use, Esplanada dos Ministerios, Bloco B, Sala 808, Brasilia-DF, Brazil

The Brazilian National Strategy on invasive alien species (IAS) is a comprehensive platform to develop the management of biological invasions and prevent their impacts in a developing and megadiverse country. The Global Biodiversity Framework (GBF) Target 6 approved by the Convention on Biological Diversity in 2022 presents new challenges and opportunities for consolidating national policies and IAS management worldwide. GBF Target 6 addresses the impacts of IAS on biodiversity and ecosystem services by managing pathways of introduction, reducing introduction and establishment rates by 2030, and eradicating or controlling IAS, especially in priority sites such as islands. The goals of the Brazilian Strategy are aligned with the target and its implementation involves a network of partners from different organizations, notably environment, health, and agriculture agencies. Nevertheless, Brazil must update the National Strategy to accommodate the requirements of the new Framework. Engaging new actors such as indigenous peoples and traditional communities presents a great challenge, along with technical capacity and data availability issues. In the symposium, we plan to share information on IAS management status, lessons learned, and challenges faced by Brazilian organizations. The goal is to present the main elements of GBF Target 6 and consider where Brazil has made progress and where further action is needed. Confidently, this would help to clarify megadiverse developing countries' needs for technical and scientific cooperation on IAS management in order to achieve international commitments.

Keywords: Invasive alien species, National Invasive Species Strategy and Action Plan (NISSAP), Kunming-Montreal Global Biodiversity Framework

Financing: National Strategy for the Conservation of Threatened Species Project (PROSPECIES), funded by the Global Environment Facility https://proespecies.eco.br/

Jack of all trades? Mechanisms behind the positive feedback invasion of the Hottentot fig on the Mediterranean coast, a life-history perspective.

Erola Fenollosa[1,2,3]

(1) Universitat de Barcelona, Department of Evolutionary Biology, Ecology and Environmental Sciences, Faculty of Biology, Avinguda Diagonal, 643, Barcelona, Spain
(2) University of Oxford, Department of Biology, 11A Mansfield Road, Oxford, United Kingdom
(3) Institute of Research in Biodiversity (IRBio-UB), Avinguda Diagonal, 643, Barcelona, Spain

The Hottentot fig, a widespread clonal invasive species, has become a major threat to biodiversity in the Mediterranean basin by impacting the physicochemical soil properties, which in turn reduces native functional and taxonomic biodiversity. While the species is known for its high plasticity, allowing it to thrive in a range of environments, the mechanisms behind its successful invasion remain unclear. Over the past five years, we have been investigating the physiological mechanisms that drive Hottentot fig's life history strategy, which includes survival, growth, and reproduction. Our research has revealed that the species' fitness is shaped by a complex interplay between programmed adaptive partial senescence, clonal growth, stress tolerance, and sexual reproduction. Specifically, reproductive senescence contributes to individual growth, stress tolerance, and the formation of a soil seed bank, thereby facilitating rapid colonization and persistence in a variety of Mediterranean ecosystems. The Hottentot fig's functional mosaic resulting from this life history strategy contributes to its success by creating a positive feedback loop of expansion and impact through the interaction of species' stress tolerance, reproductive effort, and adaptive senescence. Overall, here I aim to provide a comprehensive overview of our research on the interlink between ecological processes and physiological mechanisms driving the Hottentot fig's invasion on the Mediterranean coast, calling for a discussion on where this species' Achilles heel might be.

Keywords: physiology, reproductive traits, coastal

Australian acacias: a showcase for remote sensing-based mapping and impact assessments of invasive trees.

André Große-Stoltenberg[1,2], Jens Oldeland[3], Christiane Werner[4]

(1) Justus Liebig University Giessen, Institute of Landscape Ecology and Resource Management (ILR), Giessen, Germany
(2) Justus Liebig University Giessen, Center for International Development and Environmental Research (ZEU), Giessen, Germany
(3) Institute for Globally Distributed Open Research and Education (IGDORE), Hamburg, Germany
(4) University of Freiburg, Ecosystem Physiology, Freiburg, Germany

Assessing the impact of invasive plant species is one of the key goals in invasion ecology. Certain invasive species, so-called invasive ecosystem engineers, can alter ecosystem to a degree that a return to the original state is unlikely with negative consequences for ecosystem functioning and services. As impact of invasive species is context-dependent, spatial data is required not only on location and impact of the invader, but also on the biophysical characteristic of the recipient ecosystem. Methods of remote sensing provide powerful tools to retrieve such data on various spatio-temporal scales, but transferability and generalisability of approaches can be challenging. Comparative, multisite-studies could shed a light on the context-dependency from both a (technical) remote sensing and an ecological perspective. The invasion of *Acacia* spp. is a global phenomenon, and most likely follows similar patterns, so worldwide, multi-site studies are possible.

Here, we will give an overview of remote sensing-based studies of invasive acacias worldwide with a focus on mapping and impact assessment. We will present a conceptual framework on how to capture plant invasive impact using remote sensing considering context-dependency, and we will demonstrate in a case study on how acacia impact on ecosystem functioning can be mapped at the landscape scale. Due to the increasing availability of remote sensing data and processing options, *Acacia* spp. invasions are an ideal showcase for remote sensing applications in the context of biological invasions from low-barrier to high-fidelity solutions.

Keywords: Remote Sensing, Wattles, Impact

Mussununga: The little-known and threatened white-sand ecosystem in the Brazilian Atlantic Forest.

Gustavo Heringer[1,2]

(1) Nürtingen-Geislingen University (HfWU), Nürtingen, Germany
(2) Universidade Federal de Lavras (UFLA), Department of Ecology and Conservation, Lavras, Brazil

The white-sand *Mussununga* is a little-known ecosystem characterized by patches of savanna-type vegetation scattered throughout the Brazilian Atlantic Forest. The *Mussununga* patches vary in size and shape and are associated with nutrient-poor, acid, and sandy soils formed by podzolization due to high humidity. Despite being neglected in scientific literature, this ecosystem is already threatened by anthropogenic disturbances such as fire, roads, and biological invasion. Here I present the results of two studies where we investigate (i) whether Atlantic Forest fragmentation and road networks increase the landscape permeability to biological invasion by *Acacia* species in the *Mussununga* and (ii) the effect of biological invasion by *Acaciamangium* and *A. auriculiformis*, disturbance caused by fire and eucalyptus management, and land-use change on *Mussununga* ecosystem. We found that landscape permeability has a positive effect on the occurrence of Acacia species in the *Mussununga*, whereas the area of *Mussununga* had a negative effect. The best landscape permeability model was built considering forest fragments and water bodies as barriers, and road networks as corridors. *Mussununga*s invaded by *Acacia* presented a reduction in abundance, basal area, and height of native woody species, and an increase of dead woody plants proportion. Eucalyptus management was associated with woody species richness and reduction of abundance on ground layer vegetation, whereas *Mussununga*s surrounded by eucalyptus plantations had higher richness and abundance of species on ground layer vegetation. The combination of anthropogenic degradation and biological invasion by *Acacia* affects the structure and composition of *Mussununga* threatening this little-known ecosystem.

Keywords: Acacia, habitat degradation, oligotrophic ecosystems

Functioning and interactions associated with invasive species: the particular case of *Acacia longifolia*.

Cristina Máguas[1] , Florian Ulm[1], Joana Jesus[1], Sara Vicente[1,2,3], Sérgio Schozas[1], Andreia Anjos[1], Cristina Antunes[1], Johannes J. Le Roux[3] & Helena Trindade[1]

[1] cE3c - Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências da Universidade de Lisboa, Campo Grande 1749-016, Lisboa & CHANGE - Global Change and Sustainability Institute, Portugal
[2] Centro de Estudos do Ambiente e do Mar (CESAM), Faculdade de Ciências da Universidade de Lisboa, Campo Grande 1749-016, Lisboa, Portugal
[3] School of Natural Sciences, Macquarie University, North Ryde, NSW, Australia
*Corresponding author: cmhanson@ciencias.ulisboa.pt

Australian acacias are considered one of the most dangerous invasive plants globally and one of the biggest environmental problems nowadays, displaying characteristics that lead to their proposal as model species of invasion. *Acacia* spp. are leguminous species native to Southeast Australia and Tasmania, particularly invasive in Mediterranean climates, such as the Iberian Peninsula, South Africa, southern Brazil and Uruguay.

The increased water use by Australian acacias in invaded regions may be related to the larger above-ground biomass when compared to native vegetation, as well as to increased transpiration rates per leaf area. Our results in *A. longifolia* in coastal sand dunes suggest that although with some degree of functional similarity, native and invasive species present different water strategies., which has been confirmed by a dissimilarity concerning biochemical leaf traits among *A. longifolia* and native species. Morever we confirmed that belowground processes, specifically their influence on the N/P balance, organic matter turnover and nutrient cycling, play an important role in explaining the differential impacts of native vs. invasive N2-fixing species, and are not related to foliar litter or coarse OM, since and early stage invasion.

In addition, we may argue that *A. longifolia* is a species with phenotypic plasticity, which maximize its competitive abilities by managing the trade-offs mentioned above as a function of each strategy importance for plant success in a particular environment. However, this successful invader is also able to manage trade-offs without a strong genetic variability.

Keywords: plant traits and thresholds; early invasion plant community interactions; global model invader

Plant Invasions and Coastal Dune Systems: linking fundamental science with management, restoration and nature conservation.

Restoration of Portuguese coastal dunes invaded by *Acacia longifolia*.

Marchante, E.[1*], Duarte, L.N.[1,2], López-Núñez, F.A.[1,2], Freitas, H.[1], Marchante, H.[1,2]

[1] Centre for Functional Ecology – Science for People & the Planet, Department of Life Sciences, University of Coimbra, Coimbra, Portugal.
[2] Polytechnic Institute of Coimbra, Coimbra Agriculture School, Coimbra, Portugal.
*emarchante@uc.pt

Coastal dunes are among the most invaded ecosystems in Portugal, with several invasive plants dominating large areas, namely *Acacia longifolia, Acacia saligna, Carpobrotus edulis* and *Cortaderia selloana*, among others. *Acacia longifolia* is one of the most widespread species. Even though it is a species that does not resprout much, the recovery of areas invaded by *A. longifolia* is hindered by the extensive areas invaded, the increased N and organic matter soil legacies that remain after removal of the species, the extensive long-lived seed bank that germinates after control, and the lack of resources that can ensure long-term follow-up controls. Physical control has been carried out, often without sufficient persistent follow-up controls, but monitoring results show that when this is possible, *A. longifolia* abundance is kept low and native plants begin to recover, restoring native communities. Additionally, the biological control agent *Trichilogaster acaciaelongifoliae* was introduced in 2015 and has since begun to reduce seed production of *A. longifolia*, helping to prevent the seed bank from rebuilding and thus the potential for (re)invasion and the spread of the species. The recovery of coastal dunes invaded by *A. longifolia* is not easy, but the integration of physical and biological control and the guarantee of a long-term investment are decisive to increase the probability of success.

Keywords: physical control; biological control; management of invasive plants

The 'WATTLES' invasion syndrome.

Ana Novoa[1], John R.U. Wilson[2,3], Johannes J Le Roux[3,4], Margherita Gioria[1], Petr Pyšek[1,5], David M Richardson[1,3]

[1] Department of Invasion Ecology, Institute of Botany, Czech Academy of Sciences, CZ25243 Průhonice, Czech Republic
[2] South African National Biodiversity Institute, Kirstenbosch Research Centre, Cape Town, South Africa
[3] Centre for Invasion Biology, Department of Botany and Zoology, Stellenbosch University, Stellenbosch, South Africa
[4] School of Natural Sciences, Macquarie University, Sydney, NSW 2109, Australia
[5] Department of Ecology, Faculty of Science, Charles University, Viničná 7, 128 44 Prague, Czech Republic.

The concept of invasion syndromes involves grouping invasions that are similar in terms of pathways, species traits, characteristics of their natural and recipient ecosystems, performance and impacts, and can be managed effectively using similar policy and management actions. An example is the 'Woody Australian Trees that Transform landscapes: Leguminous, Enemy-free, with persistent Seed banks (WATTLES)' invasion syndrome, which refers to the invasion of woody Australian Acacia species that can form large, long-lived seed banks and that are introduced with high propagule pressure together with their compatible rhizobia (or into areas with compatible rhizobia) into regions with suitable climates and that lack specialist natural enemies. When this happens, the introduced acacias establish invasive populations and have significant impacts by modifying the hydrological, nutrient and fire cycles of the invaded ecosystems, often leading to invasional meltdown, and the displacement of native species. To prevent further invasions within the WATTLES invasion syndrome, deliberate introductions of acacias should be carefully regulated or prohibited, and management efforts can include classical biocontrol supplemented by physical and chemical methods and active restoration efforts. The WATTLES invasion syndrome may be extended to invasions by other woody legume species such as *Prosopis* spp. and *Robinia pseudoacacia* L.

The IPBES Assessment of invasive alien species and their control: the process, the results and the challenges ahead.

Anibal Pauchard[1,2] , Laura Meyerson[3] , Phil Hulme[4] , Rafael Zenni[5] and Loreto Castillo[6]

(1) Laboratorio de Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile
(2) Instituto de Ecología y Biodiversidad (IEB), Santiago, Chile
(3) University of Rhode Island, Natural Resources Science, College of Environmental Life Sciences, 9 East Alumni Avenue, Kingston, USA
(4) Bioprotection Aotearoa, Department of Pest Management and Conservation, Lincoln University, PO Box 85084, Lincoln, New Zealand
(5) Federal University of Lavras, Ecology & Conservation, Institute of Natural Sciences, Campus Universitario, Lavras, Brazil
(6) Institute of Botany, Department of Invasion Ecology, Zámek 1, 252 4, Průhonice, Czech Republic

In September 2023, the IPBES global thematic assessment of invasive alien species and their control is expected to be approved by representatives of more than 140 countries in the 10th IPBES plenary in Bonn, Germany. This first comprehensive global assessment comprises six chapters including global and regional status and future trends, drivers of biological invasions, impacts of invasive alien species, management tools and future policy options for the management of invasive alien species. The IPBES assessment of invasive alien species and their control has brought together more than 80 experts spanning diverse disciplines. Several of these experts will be present at EMAPi2023 and therefore this round-table is expected to showcase their experience in the process, emphasizing the results that are relevant to plant invasions. Our aim is to highlight the process of developing a thematic IPBES assessment, embracing diverse values and knowledge systems. We also want to discuss our major results and how those will impact management and policies globally. Finally, we want to outline potential actions and challenges ahead to get the most out of this tremendous four-year effort. With this in mind, we expect to engage in a participative activity with all the audience to gather ideas in how to best proceed in promoting the results and the implementation of this IPBES assessment to strengthen national and global efforts to tackle biological invasions.

Book Launch: "Wattles: Australian Acacia species around the world".

Dave M. Richardson[1], Jaco Le Roux[2], Elizabete Marchante[3]

(1) Centre for Invasion Biology, Stellenbosch University, South Africa
(2) Macquarie University, School of Natural Sciences, North Ryde, Sydney, Australia
(3) Centre for Functional Ecology – Science for People & the Planet, Department of Life Sciences, University of Coimbra, Coimbra, Portugal

This presentation discusses the contents of a new book which provides a comprehensive overview of current knowledge about "wattles", a large clade of over 1000 species of trees and shrubs in the genus *Acacia*, many of which are major invasive species. The book examines the biology, ecology, evolution, and biogeography of wattles in their native ranges, including the evolutionary forces that have driven past speciation and adaptation to diverse environments, the conservation status, uses and human perceptions of these species. It considers the different histories of the introductions and proliferation of wattles as alien species in different parts of the world in recent centuries. Diverse political, socio-economic and scientific contexts provide drivers for *Acacia* introductions and shape the dynamic perceptions of impact and options for management. The presentation will touch on some highlights of the book.

Appearances Can be Deceptive: Contrasting Impacts of a Native and an Invasive Plant Species on Coastal Dune Ecosystems.

Lilliana Vasquez[1], Jorge Perez-Quezeda[1,2,3], **Bruce Osborne**[4,5]

(1) University of Chile, Department of Environmental Science and Renewable Natural Resources, Faculty of Agriculture, Santiago 8820808, Santiago, Chile
(2) Institute of Ecology and Biodiversity Barrio Universitario, Victoria 631, Concepción 4030000, Concepción, Chile
(3) Cape Horn International Center, O'Higgins Nº310, Cabo de Hornos 6350000, Chile
(4) University College Dublin, UCD School of Agriculture and Food Science, Agriculture, Belfield, Dublin, Ireland
(5) University College Dublin, UCD Earth Institute, College of Science, Belfield, Dublin, Ireland

It is often assumed that introduced species have a greater impact on ecosystems than native species, although there is still a paucity of comparative information to support this. Resolution of this is becoming more important as anthropogenically-related shifts in the range of native species are also likely to impact on ecosystems where colonizing species were formerly excluded. To examine this, we assessed the impacts of two N-fixing plants, *G. tinctoria*, a native and *U. europaeus*, an invasive species, on coastal dune ecosystems on Chiloe Island, Chile. A significant decrease in species richness occurred in areas colonized by *U. europaeus*, whilst areas occupied by *G. tinctoria* had a comparable number of species to those in uncolonized areas with a similar plant diversity. Fewer plant orders and families were also found in areas invaded by *U. europaeus*, with an increase in alien species richness and an almost 50% reduction in native species. However, there were still subtle changes in species assemblages associated with colonization by *G. tinctoria*. In contrast, *G. tinctoria* had a greater impact on soil C and N stocks than *U. europaeus*, with a significant enrichment in both elements. Broadly these results are consistent with invasive plant species having a more significant effect on above ground plant communities, but contrasting effects on soil nutrients, with a native species having a greater impact than an introduced species. Given the absence of any effects of *U. europaeus* on soil nutrients, modifications in the above ground vegetation were not linked to edaphic factors.

Keywords: native, introduced, dunes

15 years of managing wattles with small, naturalised populations in South Africa.

John Wilson[1,2], Virgil Jacobs[1], Nolwethu Jubase[1], Sandile Mdoko[1], Mokgatla Rapetsoa[1,2], Nicholas Salonen[1,2], Ashley Baloyi[1], David Richardson[2], Mlungele Nsikani[1]

(1) South African National Biodiversity Institute, Kirstenbosch Research Centre, Cape Town, South Africa
(2) Centre for Invasion Biology, Department of Botany and Zoology, Stellenbosch University, Stellenbosch, South Africa

Wattles are amongst the most damaging invasive plants in South Africa. More money is spent controlling wattle invasions by government (through the Working for Water Programme) than on other plant invasions. The extent and pattern of current wattle invasions show a clear signal of historical introduction and planting efforts; the corollary is that wattles with small, naturalised distributions will spread and cause harmful impacts if given the chance. On this basis, we (the South African National Biodiversity Institute specifically) have, since 2008, systematically identified and managed populations of wattles with limited distributions. We review progress and highlight a few lessons learnt: 1) Initial control efforts were arduous. 2) Initial surveys and control efforts missed large trees and even some populations (the discovery of new populations means eradication looks infeasible for *A. stricta*). 3) Seed production was not prevented if annual follow ups were missed. 4) Annual clearing has led to substantial declines in several populations (*A. adunca, A. fimbriata, A. paradoxa, A. parvistaminea, A. piligera, A. viscidula*). 5) Collecting point data and managing such data are time intensive but have allowed us to track how the distribution and abundance have changed over time. 6) Different approaches are needed to keep search effort high, especially when plants are rare and when starting surveys each year. And 7) the approach to control should vary with population size. In conclusion, while there are many opportunities to be innovative, we argue the best response to persistent seedbanks is persistent control.

Keywords: wattles, eradication, search effort

Out of sight out of mind? Soil legacy effects of Acacia invasions and their implications for restoration in South Africa's Cape Floristic Region.

Florencia A. Yannelli[1,2*], Jan-Hendrik Keet[1], Johannes J. Le Roux[1,3]

[1] Centre for Invasion Biology, Department of Botany and Zoology, Stellenbosch University, Matieland 7602, South Africa
[2] Freie Universität Berlin, Department of Biology, Chemistry, Pharmacy, Institute of Biology, Königin-Luise-Str. 1-3, 14195 Berlin, Germany
[3] Department of Biological Sciences, Macquarie University, Sydney, 2109, Australia

Invasive Australian acacias are a threat to the species rich Cape Floristic Region (CFR) of South Africa. When invasive acacias become dominant in these habitats, they change the composition of plant communities as well as their associated soil microbial communities and soil chemistry. Such alterations lead to plant-soil feedbacks favoring the persistence of acacias. These changes can persist even after the removal of the Acacia plants in the form of legacy effects and can hinder the recovery of native plant communities. Here we evaluate the impact that invasive acacias have on plants, soil properties and microbial communities in the CFR. We seek to disentangle the legacy effects of Acacia invasions on the recovery of native vegetation following clearing, by comparing neighboring areas where pristine fynbos, *Acacia saligna*-invaded, and previously cleared sites. To do so, we conducted vegetation surveys, sampled soil chemical and bacterial composition. We found invasive Australian acacias removal increased diversity of plant communities. Yet, acacia mediated impacts associated to high pH and phosphorus content persisted after clearing, leading to increased soil microbial diversity compared to the lower values found in reference sites. Overall, our study shows that even when acacias are removed from the system, legacy effects of nitrogen fixing and colonisation by secondary invaders can hinder full recovery of native vegetation.

Keywords: *Acacia saligna*; passive restoration; Fynbos; plant-soil feedbacks; isotopes

Developing national lists of invasive alien species, impact assessments, and priority settings for prevention and early detection for a megadiverse, continental-scale country.

Rafael Zenni[1]

(1) Federal University of Lavras, Ecology & Conservation, Institute of Natural Sciences, Campus Universitario, Lavras, Brazil
rafael.zenni@ufla.br

In December 2020, the Brazilian Ministry of Environment and Climate Change launched an initiative for developing national lists of invasive alien species, analysis of pathways, impact assessments. The goal was to generate one list of invasive alien species present and currently invading ecosystems and Brazil, and a second list of invasive alien species with high potential to become invasive in ecosystems and Brazil in this decade. Both lists should be backed up by the current state of the art techniques and knowledge to characterize and systematize biological invasions, including comprehensive multi-language literature searches, horizon scan, environmental impact classification for alien taxa (EICAT), pathways of introduction following Convention on Biological Diversity standards, large scale occurrence records manipulation, public consultation, expert validation for each one of the analyses, and last but not least, development of guidelines and protocols for future updates and subnational implementation of these analyses. Given Brazilian´s high biodiversity, ecological variability, and continental size, there was an important challenge to deal with species that are both native and invasive aliens in the country. Numerous other challenges needed to be overcome to tackle such large-scale analyses to reach the expected quality of the results. In this proposed symposium we plan to present the work carried out since December 2020 to develop national lists of invasive alien species, analysis of pathways, impact assessments, and priority settings for prevention and early detection for Brazil, and discuss its challenges, lessons learned, main results, and future implementation into policy and management.

Keywords: (1) national lists of invasive alien species, (2) impact assessments, (3) prevention and early detection.

Pró-Espécies, Ministério do Meio Ambiente e Mudança do Clima

Pathways of introduction of invasive non-native species in Brazil.

Sílvia Renate Ziller[1]

(1) The Horus Institute for Environmental Conservation and Development, Brazil
sziller@institutohorus.org.br

A pathways and vectors assessment using the classification adopted by the Convention on Biological Diversity (Harrower et al. 2018) was conducted for invasive alien species in Brazil based on global data of species introductions. Three species lists were compiled: species present and recognized as invasive in Brazil, species classified as contained (in confinement or production, not present in natural areas), and species at risk of being introduced. In total, 557 species were assessed: 190 plants and 255 animals invasive in Brazil, 12 plants and 17 animals contained, and 36 plants and 47 animals at risk of introduction. As a result, 1284 pathways and vectors were compiled based on 515 scientific and technical publications. The assessment was aimed to indicate the main pathways per biological group (freshwater, marine, and terrestrial plants and animals) that should be prioritized for management by the Ministry of Environment and related agencies. The main pathways are: (a) for freshwater vertebrates, aquarium – pet species, fishery in the wild, and aquiculture; (b) for freshwater invertebrates, ballast water and hull fouling; (c) for freshwater plants, aquarium species and ornamental plants; (d) for marine vertebrates, aquarium – pet species; (e) for marine invertebrates, ballast water and hull fouling; (f) for marine plants/algae, ballast water and hull fouling; (g) for terrestrial vertebrates, terrarium – pet species, hunting in the wild and zoo species; (h) for terrestrial invertebrates, transportation of habitat materials, plant contaminants and hitchhikers on ship/boat; and (i) for terrestrial plants, ornamental use, horticulture, and botanical gardens.

Keywords: pathways, invasive species, freshwater, marine, terrestrial

Management of plant invasions in southern Brazil.

Sílvia Renate Ziller[1]

(1)The Horus Institute for Environmental Conservation and Development, Brazil
sziller@institutohorus.org.br

Coastal dune ecosystems are highly relevant for acting as barriers against extreme weather events forming on the ocean. Invasive plant management in southern Brazil targets species that impact coastal scrub vegetation (restinga). Pine trees (Pinus spp.) introduced for forestry and ornamental plants, especially in the Asparagaceae family (Asparagus, Furcraea, Yucca) are especially detrimental and aggressive in these ecosystems. Scarce reference on the control of Asparagaceae species, or the lack of herbicides used in other countries, led to experimentation in the spirit of adaptive management over a year of work. Approximately 2,500 medium and large Furcraea foetida plants were controlled with application of a Triclopyr mixture at 2% dilution in 2022; approximately 15% survived and resprouted, although debilitated. These plants were treated again in April – May 2023 and are not expected to survive. Yucca filamentosa plants were cut at the base with a handsaw and the stumps treated with Triclopyr at 2% dilution. The stumps did nor sprout back, but the plants left on the ground require follow up as they can produce new sprouts. Asparagus sprengeri and A. setaceus were initially treated with a mixture of Triclopyr (1%), Glyphosate (1%), urea (10g/l) and a penetrant. While A. setaceus was more easily eliminated even with Glyphosate only, A. sprengeri dried up only partially, then recovered from treatment over the summer months. Another herbicide solution proved more efficient with Metsulphuron Methyl (1,5g/10l) and Glyphosate (1%), but results are still to be confirmed. All herbicide solutions are applied with dye and protective equipment.

Keywords: coastal scrub, invasive plants, herbicides, Asparagaceae, restinga

Oral Communications

Elucidating the patterns and processes of plant invasions in polar ecosystems.

Ian S. Acuña Rodríguez[1], Luis Pertierra[2]

(1) Universidad de Talca, Centro de Ecología Integrativa, Instituto de Investigaciones Interdisciplinarias (I3), Campus Lircay, Av Lircay (s/n), Talca, Chile
(2) University of Pretoria, Plant and Soil Science, Private Bag X20, Hatfield, South Africa, Hatfield, South Africa

Polar regions are affected by global change, being particularly susceptible to the arrival of non-native species with the amelioration of climatic conditions. Developing the plant alien biosecurity at the poles requires a comprehension of the key factors in the invasion processes. A number of vascular plant species from a list of families have established at the various archipelagos of the polar zone; their colonization histories informs us on the invasion patterns in these extreme systems. Thus, we revisited first the historical knowledge acquired in the context of the general invasion science hypotheses, and tested next these hypotheses by analysing the trait characteristics that polar alien species share to inform on the key drivers for invading these extreme environments. Our phylogenetic path analyses reveal the general formula of success involving aspects of macro-physiology, morphometrics and life strategies. Once we apply all these insights to the general body of ecological theory in community ecology we would be able to anticipate the scenarios of polar invasion, and ultimately assess the consequences for the related ecosystem services. Thus, to conclude, an overall picture of biodiversity change perspectives in polar systems is presented.

Leaf functional trait variation in native and non-native plant species along an elevational gradient in the Andes of central Chile.

Vinka Anic[1,2], Maritza Mihoč[1,2], Graciela Valencia[1,2], Claudia Reyes-Bahamonde[2,3], Noemí Labra[1,2], Lohengrin A. Cavieres[1,2]

(1) Universidad de Concepción, Departamento de Botánica, Facultad de Ciencias Naturales y Oceanográficas, Concepción, Chile
(2) Instituto de Ecología y Biodiversidad (IEB), Chile
(3) Instituto Milenio Limit of Life (LiLi), Chile

Anthropogenic disturbances have been responsible for the introduction of many species from their native ranges to new regions at unprecedented rates. Some non-native plant species may become invasive through the establishment and spread of self-maintaining populations in their new habitats. However, cold temperatures and propagule limitation in alpine ecosystems could constrain the expansion of non-native plant species into high-elevation sites. Despite that, some non-native plant species have shifted higher along elevational gradients, which might be favoured by functional trait variation. In the central Chilean Andes, both drought at low elevation and low temperatures at high elevation could account for conservative leaf traits. We studied seven leaf functional traits in both native (N = 95) and non-native (N = 27) plant species growing near roads along an elevational gradient (1200 to 3600 m) in central Chile. According to a PCA that included both groups of plants, the elevational variation in leaf functional traits was mainly explained by changes in leaf nitrogen content (N), leaf C:N ratio, leaf dry matter content (LDMC) and leaf thickness. Below the treeline, functional responses of native species varied from conservative (high LDMC and C:N ratio) to acquisitive (high N and leaf area), whereas non-native plant species mostly showed acquisitive leaf traits along the entire elevational gradient. However, thicker leaves were found in both native and non-native species at higher elevations (2400-3100 m). These findings suggest that the spread of non-native plant species in the central Chilean Andes might be dependent on functional responses to cold temperatures.

Keywords: leaf functional traits, elevational gradient, central Chilean Andes

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What have we learned with the use of the global climatic niche in alien plant species? A brief review using two examples of our recent investigation.

Ramiro O. Bustamante[1]

(1) University of Chile, Departament of Ecological Sciences, Facultad de Ciencias, Las Palmeras 3425, Santiago, Chile

Alien species are a threat to biodiversity. Understanding their niche requirements may help us to predict potential geographic distribution. Invasive species are also interesting because they help us to examine species niche potentialities that cannot be expressed in their native range. Most alien species have colonized vast regions of the world; in that case, the global niche, i.e., the set of conditions and environments that one species occupy and persist in regions beyond its native range, adequately represent niche potentiality. In this presentation, we present a summary of two investigations conducted during the last years. Firstly, we present a classification system for predicting invasiveness, using global climatic niche for a set of 49 alien plant species in Chile. We demonstrated that climatic niche is adequate to classify species invasive status, based on the prediction of their potential distributions. Secondly, we used global climatic niche to predict the upper range limit of alien plants in the Andes, Central Chile. Our results suggest that global climatic niche predictions of the upper range limit did not match with observations for the 87% of species, which suggest that most invasive species are not in equilibrium with their climatic requirements. These studies highlight the general idea that global climatic niche is a legitimate representation of invasive species requirements. Global climatic niche is also adequate to predict invasion in regions where there exist scarce information.

Keywords: Global niche models, potential distribution, invasive plants

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Preserving the Earth's paradises: assessing the threat that alien plant invasions pose to conservation efforts in protected areas.

M. Loreto Castillo[1], Desika Mařík ová-Moodley[1], Ana Novoa[1], Petr Pyšek[1,2]

(1) Institute of Botany, Department of Invasion Ecology, Zámek 1, 252 4, Průhonice, Czech Republic
(2) Charles University, Department of Ecology, Faculty of Science, Viničná 7 128 44, Prague, Czech Republic

Protected areas (PAs) are key for protecting biodiversity and can act as partial barriers to invasions. However, alien species often spread into PAs due to insufficient funding for their control and the lack of policies or guidelines to manage them. Globally, the number and magnitude of plant invasions in PAs are increasing. To understand to which extent conservation efforts in PAs are being threatened by plant invasions, we built the Protected Areas and Invasive Alien Species (PROTIAS) database as part of the research project "Macroecology of plant invasions: a global synthesis across habitats" (www.synhab.com). The PROTIAS database compiles data on the presence of naturalized alien plants in ~1300 PAs distributed along over 100 world regions. Here, we evaluated how the number and proportions of naturalized plants in PAs depend on their traits, the type of habitat under protection, the level of anthropic influence, the size, year of establishment and the type of protection of the PAs. We also considered how country-specific socio-economic and environmental indices might affect these patterns. The PROTIAS database will offer insights into the current status and key trends on invasive alien plant species in PAs globally, will allow to explore potential invasion mechanisms and support the incorporation of plant invasions into PAs management programmes.

Keywords: Alien plant species, Biodiversity conservation, Macroecology

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Thresholds and the importance of native seed rain and invasive grasses in limiting understory recruitment in a Hawaiian forest.

Carla DAntonio[3], Stephanie Yelenik[1], Evan Rehm[2]

(1) USDA Forest Service, Rocky Mountain Research Station
(2) Austin Peay State University, Biology
(3) University of California, Santa Barbara, EEMB and Enviromental Studies

Invasive African pasture grasses have benefitted from the planting of an N-fixing native tree canopy during the restoration of montane pasturelands in Hawai'i to the detriment of native understory woody plants. We sought to identify whether there were threshold levels of invasive grass reduction that needed to be achieved simultaneous with increased native seed rain to promote 'passive' restoration of these grass dominated, restored forest stands. Using a combination of survey data, and a grass reduction x seed addition experiment, we identified a threshold level of grass reduction that was needed to enhance native seedling recruitment. Yet additional work removing all grasses showed a dramatic increase in an aggressive secondary invader. Currently, levels of 'natural' seed rain are far too low to promote woody plant recruitment with any level of grass reduction. Thus, restoration in the face of invasive grass domination and secondary invaders, should involve partial grass reduction along with enhanced seed inputs.

Keywords: invasive grasses, understory restoration, thresholds

Prevalence in historic nursery catalogues and taxonomy best predict which non-native ornamental species have naturalised in New Zealand.

Thomas N. Dawes[1], Jennifer L. Bufford[1,2], Philip E. Hulme[1]

(1) Lincoln University, Department of Pest-Management and Conservation, Faculty of Agriculture and Life Sciences, Lincoln, Canterbury, 7647, New Zealand
(2) Manaaki Whenua Landcare Research, Lincoln, Canterbury, New Zealand

Non-native ornamental plants introduced through the horticultural industry have greatly contributed to the pool of naturalised and invasive species, both globally and in New Zealand. Previous work has indicated that both high propagule pressure and traits may increase the likelihood of naturalisation or invasiveness of a given species, but these conclusions are weakened by a lack of data on introduced non-naturalised species. Using historic live-plant nursery catalogues from across New Zealand over nearly 150 years we determined prevalence across catalogues for naturalised non-native species and their non-naturalised congeners. We also compiled traits from horticultural databases; we looked at maximum height, woodiness, deciduousness, propagation, hardiness, pH range, soil moisture conditions, and sunlight preferences. We then utilised a boosted classification model to assess the relative importance of catalogue prevalence, traits, and taxonomy, using a measure of the family-level tendency to naturalise globally. Our model indicates that historical catalogue prevalence, and to a lesser degree taxonomy, better predict species naturalisation compared to species traits. Using the same methods, we also compared problematic weed species with naturalised non-weed species. This analysis indicated that catalogue prevalence was still the most important factor, however this was somewhat reduced and species traits such as maximum height, pH range and hardiness have greater relative importance than in the model of naturalisation. Both these results indicate that invasion history or propagule pressure, as well as taxonomic affinities, are at least as important as traits in determining naturalisation and invasion success.

Keywords: Ornamental Prevalence Traits

Chemical and hormonal control of Gleditsia triacanthos L. in a riparian forest of the Pampean Province.

Fabián Del Giorgio[1], Andrés Baietto[1], Jaime González-Tálice[1], Carolina Toranza[1]

(1) Universidad de la República, Departamento Forestal, Facultad de Agronomía, Garzón 780, Montevideo, Uruguay

Biological Invasions constitute a major challenge for native forest conservation and management. *Gleditsia triacanthos* L. invades the Pampean riparian forests and its management requires greater control effectiveness. With about 36% females (polygamous dioecious), the inhibitory effects of giberellic acid (GA3) would reduce seed load, allowing the gradual regeneration of native trees, reducing costs and environmental impacts of used herbicides. Hypotheses: (H1) chemical control (herbicide) applied by drilling the trunk, has different effectiveness rate (%) depending on application season (spring vs. autumn); (H2) GA3 decreases fruit production, lowering its propagule load. The objectives were to evaluate the application season for a commercial herbicide mix on adult mortality and the use of GA3 on fruiting. Application season of 2,4D + Picloram was tested on spring and autumn, recording adult mortality (%). GA3 was applied on female flowering individuals, and the effect on fruiting (%) was recorded. GA3 was tested on drilled trees with GA3 and trees with GA3 spraying, compared to control individuals. Mortality was 90% on spring and 76% on fall. No mortality was found in control individuals. On GA3 evaluation, drilled trees showed 75 % of fruit inhibition, while sprayed showed no difference with control ones. In protected areas, where the objective is to minimize environmental impacts, the herbicide injection in spring maximizes the effectiveness and reduces the impact. GA3 opens a range of possibilities for the control of invasive trees which have higher propagule production capacity than native trees, reducing fruiting and contributing to the seed bank depletion.

Restoration worse than invasion? Insights from a comparative study on soil biota and functioning in the case of Reynoutria spp.

Fanny Dommanget[1], Chauvat Matthieu[2], Forey Estelle[2], Fanin Nicolas[3], Erktan Amandine[4,5], Chesseron Coralie[3], Francois Adeline[1]

(1) INRAE, LESSEM, U. Grenoble Alpes, 2 rue de la papeterie, Saint-Martin d'Hères, France
(2) Normandie UNIV, ECODIV, UNIROUEN, Rouen, France
(3) INRAE, UMR 1391 ISPA, Bordeaux Sciences Agro, 71 av. Edouard Bourlaux, Villenave d'Ornon, France
(4) J.F. Blumenbach Inst. of Zoology and Anthropology, U. of Göttingen, Göttingen, Germany
(5) IRD, Eco&Sols, U. Montpellier, Montpellier, France

Reynoutria complex of species is widely known as part of the worst invasive alien plant species worldwide. These rhizomatous species originating from Eastern Asia are able to rapidly dominate plant communities along riverbanks. They are known to affect plant diversity and soil ecosystem functioning through their high growth rate, thick litter and allelopathical properties. Because of their high resprouting ability, the efficiency of traditional management methods is hardly achieved at the cost of intense efforts. Managers are therefore turning to alternative methods such as planting competitive native plants to both limit the dominance of the invaders and restore native plant diversity. If several papers found that *Reynoutria* species alter soil properties, no study has ever investigated the effect of such management methods after invasion. Through an observational study on seven paired-sites (restored /invaded/references) along two riverbanks in France, we measured soil chemical properties along with enzyme activities, soil microbiology, soil fauna as well as plant biodiversity to understand the changes induced by *Reynoutria* invasion and by management planting methods. Our results confirm drastic effects of *Reynoutria* species on plant diversity and high benefit of the restoration method on flora. However, considering the soil compartment, chemistry and microbial activity were more altered on restored banks than on the invaded banks compared to reference banks and we observed a disconnection between plant community and soil functioning in restored plots. We discuss these results in the light of the age of the restoration and question the management practices that reshape the soil.

Keywords: Invasive alien plant species, Fallopia, Restoration

Climate-induced changes in phenological cycles of native and exotic ephemeral species in Fray Jorge's thorn scrub.

María del Pilar Fernández Murillo[2, 5], Constanza Weinberger[3], Víctor Pasten[3], Gerardo Gutiérrez[1], Natalia Ricote[3], Karin Maldonado[3], Daniel Park[7], Charles Davis[6], **Alejandra J Troncoso**[1, 2], Douglas A. Kelt[4]

(1) Universidad de La Serena, Biology Department, Raul Bitran 1305, La Serena, Chile
(2) Instituto de Ecología y Biodiversidad, Las Palmeras 3425, Santiago, Chile
(3) University Adolfo Ibañez, Faculty of Liberal Arts, Diagonal Las Torres 2640, Santiago, Chile
(4) University California Davis, Department of Wildlife, Fish, and Conservation Biology, 455 Crocker Lane, Davis, California, United States of America
(5) Universidad Mayor, Centro de Biología Integrativa, Camino La Pirámide 5750, Santiago, Chile
(6) Harvard University, Harvard University Herbaria, 22 Divinity Avenue, Cambridge, United States of America
(7) Purdue University, Department of Biological Sciences, 915 Mitch Daniels Boulevard, West Lafayette, United States of America
*Corresponding author: matroncoso@userena.cl

The phenology of various species and the timing of life-cycle events in plants and animals have been significantly altered by climate change, notably rising temperatures. Although the impact of temperature has been extensively studied, more research is still needed to fully comprehend the impact of other climatic factors, such as precipitation. Ephemeral species may face significant changes in plant phenology in arid areas, and frequently use the nurse effect of shrubs in dry ecosystems to survive drought, high temperatures, and radiation. However, little is known about how this nurse effect affects plant phenology. In Fray Jorge's LTER, we monitored ephemeral plant communities for nine years (2011-2019), noting when their vegetative, floral, and fruiting phenophases began and ended. We selected 30x30cm plots beneath and outside nurse shrubs (*Porlieria chilensis*), and evaluated how temperature and rainfall affected the phenological shifts of native and exotic ephemeral species. Phenophases in plants growing beneath nurse plants were more brief, but native and exotic annuals and geophytes showed no appreciable differences. We found that the threshold for ephemeral plant phenology is 15 mm of cumulative rainfall, with delays in reaching this threshold being linked to delayed phenophase onset and shorter duration. With distinct effects in the autumn and winter, the temperature played a supporting role. These results offer empirical proof that precipitation patterns in arid ecosystems play a crucial role in determining the phenology of ephemeral plants, indicating that impacts of climate change could significantly impact entire plant communities.

Keywords: phenology, arid ecosystems, Fray Jorge Lter.

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Assessing 20 years of implementing ornamental alien plant control in Kruger National.

Llewellyn Foxcroft[1,2], Jan-Hendrik Keet[2], Arunava Datta[2,3], Sabrina Kumschick[2,3], Geoff Nichols[4], David Richardson[2,5], John Wilson[2,3]

(1) South African National Parks, Scientific Services, Skukuza 1350, South Africa
(2) Stellenbosch University, Centre for Invasion Biology, Department of Botany and Zoology, Stellenbosch, Matieland 7602, South Africa
(3) South African National Biodiversity Institute, Kirstenbosch Research Centre, Cape Town, South Africa
(4) Private, Suiderstrand 7140, Suiderstrand, South Africa
(5) The Czech Academy of Sciences, Department of Invasion Ecology, Institute of Botany, 252 43, Průhonice, Czech Republic

Ornamental alien plants are a major pathway of invasion, including into Kruger National Park (KNP). Some of the most widespread invasive alien plant species in KNP were introduced as ornamental plants, such as *Opuntia stricta, Lantana camara* and *Pistia stratiotes*. Early control efforts aimed to remove such species from cultivation and banned the planting of invasive species. Between 1999 and 2003 a survey was conducted across 36 tourist camps and staff villages to determine the species present and provide a baseline for developing a comprehensive alien plant control policy. Following nearly two decades of implementation, the camps were resurveyed in 2020 to assess the efficacy of the policy, which was based on the national regulations on alien plants promulgated in 2001 and 2014.

The number of alien plant species recorded in KNP has almost doubled since the first survey (from 231 to 438), although there has been significant species turnover (93% average replacement across all camps). Importantly, however, both the number of listed and regulated alien plant species found in KNP, and their species richness per camp, have declined (by 38% overall and by 56% per camp). This suggests that regulations are effective. In contrast, the number of unregulated ornamental alien species recorded has increased (by 157% overall). This is likely partly due to an increase in survey effort. Alien species regulations provide clear guidance for conservation managers, and there are promising signs of their effectiveness in directing management in KNP.

Keywords: Policy, Management outcomes

Financing: Centre for Invasion Biology, Stellenbosch University; South African National Parks

Whole-plant functional ecology of invasive species: what are we missing?

Jason Fridley[1,2]

(1) Syracuse University, Biology, 107 College Place, Syracuse, USA
(2) Clemson University, Biological Sciences, 132 Long Hall, Clemson, USA

Viewed through the lens of functional ecology, plant invasions occur when introduced species either acquire more resources, or convert those resources into offspring more efficiently than native species. The first process of acquisition, particularly in the context of carbon uptake and leaf economics, is well explored as a common advantage of invaders. The second process of resource-use efficiency remains understudied, particularly for belowground processes involving both nutrient acquisition and carbon costs of foraging behaviors. I present theory for addressing the functional ecology of plant invasions from a whole-plant perspective, emphasizing the need for empirical approaches that quantify the costs of resource acquisition above- and belowground. I then illustrate this approach with a greenhouse study of four native and four invasive grass species, where whole-plant carbon and nitrogen budgets were estimated with tissue analysis and a custom gas exchange system that isolated CO2 fluxes in above- and belowground tissues. Aboveground, the relationship of shoot carbon gain and total nitrogen content (whole-shoot photosynthetic nitrogen-use efficiency, NUE) was relatively consistent, and invaders showed higher NUE than native species. In contrast, the inverse belowground relationship of nitrogen uptake per unit carbon cost (CUE, carbon-use efficiency) was highly variable and did not depend on native-invasive status. These results point toward a diversity of whole-plant functional strategies even under artificial conditions. Renewed emphasis on measuring belowground carbon costs, in addition to leaf-level acquisitive traits, may help resolve the functional basis of invader success in competitive habitats.

Keywords: resource-use efficiency, belowground functional strategies, resource economics

Financing: I acknowledge support from the U.S. National Science Foundation.

A novel protocol for assessing impacts of invasive alien species on threatened biodiversity assets.

Jens Froese[1], Ben Gooden[1]

(1) CSIRO, Health and Biosecurity

Invasive alien species (IAS) are a major threat to biodiversity at a global scale. Developing robust measures of their negative impacts on native biodiversity assets is required for effective threat mitigation. However, IAS impacts are complex and highly context dependent. As such, they are rarely measured directly and poorly generalisable. Assessments have often relied on surrogate measures, or assumptions about potential impacts from evidence elsewhere. An alternative approach has been to develop standardised impact assessment protocols that synthesize evidence from a range of sources in a systematic, repeatable, and comparable form. Among these, the *IUCN Environmental Impact Classification for Alien Taxa (EICAT)* standard for measuring the magnitude of IAS impacts has gained the most momentum by researchers and policy makers alike.

We adapted the *EICAT* protocol so that it can be applied to assessing biodiversity impacts of IAS at the level of interactions with co-occurring native species and ecological communities, while maintaining consistency with its core principles and terminological framework. We applied the adapted protocol to assess the evidence of impact caused by 22 significant weed and pest animal species on 97 listed threatened species and ecological communities in New South Wales (Australia) using a structured expert elicitation protocol. Results showed that many weeds currently cause significant biodiversity impacts, including local population extinctions of native species. We suggest that our adapted protocol provides a flexible and repeatable framework for capturing variability in, and enabling comparisons between, IAS impacts across threatened taxa and spatial or temporal scales.

Keywords: impact assessment, magnitude of impact, structured expert elicitation

Synergies between wildfires and plant invasions: Moving forward to protect threatened old-growth forests of *Araucaria araucana*.

Andrés Fuentes-Ramírez[1,2], Bernardita Diaz-Mons[1,2], Camila Fernandez-Urrutia[1,2], Octavio Toy-Opazo[1,2]

(1) Universidad de La Frontera, Departamento de Ciencias Forestales, Laboratorio de Ecosistemas y Bosques (EcoBos), Temuco, Chile
(2) Centro Nacional de Excelencia para la Industria de la Madera (CENAMAD), Pontificia Universidad Católica de Chile, Santiago, Chile

Fire regimes are changing dramatically worldwide. Nowadays, more areas not adapted to fires are been subjected to increasing threats due to more recurrent and severe wildfires. Usually, fire disturbance prompts other cascading effects that amplify these impacts into the receiving native community. Early detection and management actions are key to avoid further invasions and recover ecosystem biodiversity and functionality. Ancient forests dominated by *Araucaria araucana* in southern Chile are both ecologically and culturally relevant, but in the last decades these ecosystems have been severely affected by wildfires. Beyond understory damage and mortality of forest canopy, there has been observed a rapid post-fire establishment of non-native plant species that were not present in the area prior to fire. Today, 8 years after fire, non-native species represent ca. 25% of vascular flora in the National Reserve China Muerta, of which only one species accounts for over 80% of coverage within some spots severely burned in the 2015 wildfire. This highly invasive species - *Cirsium vulgare* - has increasingly covered burned areas that also have been subjected to cattle grazing, thus representing a synergistic feedback between fire and grazing, being the cattle vectors for plant invasions after fire. It is key that those areas with higher invasions are managed accordingly by (i) controlling the spread of and (ii) prioritizing severely burned areas to be excluded from cattle grazing and browsing. These actions are meant to be executed by the forest service in collaboration with local communities and supported by evidence-based science.

Keywords: Post-fire invasions, Protected areas, Sinergies & management

Financing: Centro CENAMAD FB 210015, ANID FOVI 220101, Anillo SCIA ACT 210052.

Genetic insights into convergent evolutionary responses in native insects to plant invasion.

Dylan Geraghty[1], Johannes Le Roux[1], Rachael Dudaniec[1], Scott Carroll[2]

(1) Macquarie University, Science and Engineering, Natural Sciences, Balaclava Rd, Macquarie Park, Sydney, Australia
(2) UC Davis, Science, Entomology and Nematology, 1 Shields Ave, Davis, USA

The degree of eco-evolutionary experience (EEE) shared between native and invasive species influence how they respond evolutionarily to each other. Soapberry bugs in the genus *Leptocoris* provide a good example. These bugs are obligate seed predators of Sapindaceae and have colonised and adapted to invasive members of this plant family. We will demonstrate ongoing evolution in the Australian soapberry bug, *L. tagalicus*, in response to two invasive balloon vine species, *Cardiospermum halicacabum* and *C. grandiflorum*. The bug has rapidly evolved longer proboscides ('beak') to more efficiently feed on balloon vine seeds, protected by large inflated fruit capsules. The two balloon vine species are separated spatially in Australia and have vastly different residence times; *C. halicacabum* was introduced centuries ago into the Northern Territory, while *C. grandiflorum* was introduced a few decades ago into Queensland and New South Wales. We show that soapberry bugs on *C. halicacabum* have beak lengths that better match host fruit size than those of bugs feeding on the more recently introduced *C. grandiflorum*. Population genomic analyses further suggest that insects on these two different host species are genetically distinct. While it is unclear whether this genetic differentiation is due to host plant association, geographic isolation, or their interaction, our results indicate that convergent evolution has occurred in these two distinct *L. tagalicus* populations. Our study highlights the significance of shared EEE in shaping future evolutionary responses in soapberry bugs and we discuss how such evolution can be utilised to control invasive balloon vine populations in Australia.

Keywords: Rapid evolution, Plant-insect interactions, Population genomics

Impact of large invasive herbs on the compositional, functional, and phylogenetic structure of native plant communities.

Margherita Gioria[1], Angelino Carta[2], Bruce Osborne[3], Petr Pysek[1,4]

(1) Czech Academy of Sciences, Institute of Botany, Pruhonice, Czech Republic
(2) University of Pisa, Department of Biology, Italy
(3) University College Dublin, UCD School of Agriculture and Food Science, Dublin, Ireland
(4) Charles University, Department of Ecology, Faculty of Science, Prague, Czech Republic

Evaluating potential changes in functional and phylogenetic relationships among the species found in the invaded plant communities is key to improving our understanding of the long-lasting effects of invasive plants on invaded communities and their reversibility. Here, we address this issue by comparing the impacts of four tall invasive herbs of global significance (*Gunnera tinctoria, Heracleum mantegazzianum, Impatiens glandulifera,* and *Reynoutria japonica*) on the compositional, functional, and phylogenetic structure of the standing vegetation and soil seed bank of invaded communities, at 16 sites. Preliminary findings have shown that the introduction of these invaders result in a reduction in species richness and subsequent decreases in functional diversity and changes in the phylogenetic structure of the standing vegetation. Yet, these invaders differ in their long-term impacts and the reversibility of any modification they cause. While both the more transient and more persistent components of the seed banks are significantly altered by invasions by *G. tinctoria, H. mantegazzianum*, and *R. japonica*, those invaded by I. glandulifera are indistinguishable from uninvaded ones, despite major compositional changes above-ground. Preliminary findings suggest a high susceptibility of phylogenetically clustered communities to distantly related invasive herbs. Yet, seed bank communities show a degree of resilience (at least temporarily) against some of these invaders. Differences in the changes associated with invasions by these large invasive herbs indicate that dominance in the vegetation and a large stature are not consistent predictors of the ecological impacts on the invaded communities.

Keywords: soil seed banks, ecosystem resilience, persistence

Spatial patterns of plant invasions in Uruguayan grasslands.

Anaclara Guido[1], Alice Altesor[1], Felipe Lezama[2], Valerie Cayssials[3], Ana Laura Mello4, José María Paruelo[1,5], Santiago Baeza[2]

(1) Universidad de la República, Instituto de Ecología y Ciencias Ambientales, Facultad de Ciencias, Iguá 4225, Montevideo, Uruguay
(2) Universidad de la República, Departamento de Sistemas Ambientales, Facultad de Agronomía, Garzón 861, Montevideo, Uruguay
(3) Universidad de la República, Departamento de Bioestadística e Informática, Facultad de Veterinaria, Ruta 8, km 18, Montevideo, Uruguay
(4) Ministerio de Ambiente, Dirección Nacional de Biodiversidad y Servicios Ecosistémicos, Plaza Independencia 710. Piso 6, Torre Ejecutiva Norte, Montevideo, Uruguay
(5) Instituto Nacional de Investigación Agropecuaria, La Estanzuela, Ruta 50, Km. 11, Colonia, Uruguay

We evaluated the level of invasion of Uruguayan grasslands, considering the most problematic invasive alien species (IAS): *Cynodon dactylon, Eragrostis plana, Senecio madagascariensis* and *Ulex europaeu*s. A hierarchical randomized national-scale sample design was performed, in which four geomorphological regions were considered: Basaltic, South-center, North-eastern sedimentary basin and Eastern-hills (75% of Uruguay). Land use/cover maps were used to randomly localize 137 quadrants of 100 km2 in grazed natural grasslands across the country. In each quadrant, five 250 x 250 m random cells were selected, within three 25 m2 plots were localized to estimate IAS's cover. We also obtained information regarding climate, landscape, soil, topography and plant community structure. The level of invasion was represented by maps, and the differences between regions was analyzed. Linear-mixed effect models were used to find variables related to the invasion pattern. We found 53% of the cells were invaded and the level of invasion differed between regions and species. The North-eastern was the most invaded (73% of the cells), followed by Eastern-hills (68%), South-center (65%) and Basaltic region (11%). *Cynodon dactylon* was the most frequent and abundant IAS, particularly in Eastern-hills and South-center regions. Its invasion was positively associated with lower range of annual temperature, higher topographical positions, lower bare soil cover, fewer proportion of forbs and higher vegetation height. The prevention of IAS should focus on the Basaltic region, while control and containment actions must prioritize the eastern and south-center of Uruguay, where the invasion was higher, and mostly focused on *C. dactylon* management.

Keywords: Río de la Plata grasslands, Cynodon dactylon, Invasive species distribution maps

Financing: Instituto Nacional de Investigación AgropecuariaAgencia Nacional de Investigación e Innovación

Why aren't Australian Acacias more invasive in New Zealand: pests, pathogens, precipitation or propagule pressure?

Philip Hulme[1]

(1) Bioprotection Aotearoa, Department of Pest Management and Conservation, Lincoln University, PO Box 85084, Lincoln, New Zealand

Species of the genus *Acacia* (wattles) were once native to New Zealand but became extinct in the Pleistocene. European settlers reintroduced wattles 90,000 years later initially for utilitarian purposes and later for ornament. Today, at least 150 *Acacia* species have been deliberately introduced into New Zealand from Australia. Of these, less than 10% have subsequently become naturalized, several soon after widespread planting in the 19th century. Most naturalized species have origins in south-eastern Australia, the native region with the closest climate match to New Zealand. Although most naturalized wattles have been classed as environmental weeds and targeted for management in one or more protected areas, only four species are the subject of regional regulations prohibiting their dissemination. Quantitative evidence of the scale of their impacts on biodiversity or ecosystem functions is lacking. Wattles are largely found in early-successional habitats where they are often outcompeted by native forest vegetation at the time of canopy closure. The absence of widespread invasion reflects that many natural enemies have been unintentionally introduced from Australia to New Zealand, including several phytophagous insects as well as wattle-specific pathogens. The latter have had a significant impact in limiting the commercial exploitation of wattles and thus can also be expected to constrain invasion. At present, wattles pose localised problems rather than a widespread threat to New Zealand's environment. However, increasing interest in further use of species in silvopastoral systems, as bioenergy feedstocks or carbon forests could increase propagule pressure to the extent that further invasive spread is likely.

Keywords: climate change, ornamental horticulture, mycorrhiza

Blackberry outcompetes endemic tree daisy in Galapagos.

Heinke Jäger[1], Miriam San José[1], Christian Sevilla[2], Bernhard Riegl[3]

(1) Charles Darwin Foundation, Restoration Ecology, Av. Charles Darwin, Santa Cruz, Galapagos, Ecuador
(2) Galapagos National Park Directorate, Av. Charles Darwin, Santa Cruz, Galapagos, Ecuador
(3) Nova Southeastern University, Department of Marine and Environmental Sciences, Halmos College of Arts and Sciences, 8000 N. Ocean Drive, Dania, Florida, USA

Studies to show whether invasive plants can induce extinction debt in native flora are rare. Competitive effects of invasions and how competition causes native biodiversity loss are complicated to evaluate. One way to do this is the experimental removal of invasive species. We monitored the effects of invasive blackberry *Rubus niveus* removal on the endemic tree daisy *Scalesia pedunculata* and the plant community in the last forest remnants on Santa Cruz Island, Galapagos, from 2014 to 2023. Vegetation composition and *Scalesia* population structure were studied in 17 plots with manual and chemical blackberry removal and compared to 17 plots, where blackberry remained. Parameters measured were number, origin and percent cover of species, as well as DBH, total height, survival and recruitment of *Scalesia*. In the presence of blackberry, *Scalesia* trees had smaller DBH and shorter maximum heights, growth rates declined for thin trees, mortality of larger trees was higher, and *Scalesia* recruitment was absent. Blackberry removal resulted in faster growth of *Scalesia*, significantly thicker and taller trees, lower annual mortality and successful recruitment. Percent cover of *Scalesia* recruits in the removal plots was about 20%, compared to almost 0% in the invaded plots, and cover of endemic species was significantly higher. In the presence of blackberry, lower survival, growth, and absent recruitment suggested that *Scalesia* could reach local extinction on Santa Cruz in less than 20 years. Swift and decisive management action is needed to prevent this from happening.

Keywords: Galapagos, Threatened endemic species, Restoration

Financing: Lindblad Expeditions - National Geographic FundKeidanren Nature Conservation FundGalapagos ProGalapagos Conservancy

Can gardeners identify 'future invaders'?

Tomos Siôn Jones[1], Alastair Culham[1], Brian John Pickles[1], John David[2]

(1) University of Reading, School of Biological Sciences, Reading, United Kingdom
(2) Royal Horticultural Society, RHS Garden Wisley, Woking, United Kingdom

Gardeners have a crucial role in reducing the spread of invasive species. An online survey to report ornamentals invading or taking over gardens was publicised at an exhibit at the Royal Horticultural Society's Chelsea Flower Show in London. A total of 558 gardeners participated with 847 reports including 251 different taxa. A simple yet structured approach is proposed to prioritise 'future invaders' reported by gardeners, such as for risk assessments. This utilises existing domestic and global naturalisation status (Global Naturalized Alien Flora) and invasive status (Country Compendium of the Global Register of Introduced and Invasive Species). The structured approach prioritises the hundreds of ornamentals which are not (yet) invasive but have already escaped and are too widely distributed to be usually considered within the scope of a horizon scanning approach. The results of this study are compared with those of a long-term citizen science project called Plant Alert, which asks gardeners to identify potentially invasive species in gardens. Adopting a structured approach should mean projects such as Plant Alert continuously and effectively feed into national efforts to prevent the introduction and establishment of 'future invaders' in the wild, mainly by prioritising species for risk assessments. Engaging with gardeners to identify 'future invaders' makes it possible to evaluate the risk of plants in gardens while at the same time raising awareness of invasive species with gardeners.

Keywords: Ornamental plants, Public engagement, Citizen science

Financing: SCENARIO NERC DTP with the Royal Horticultural Society as a CASE partner. The exhibit at Chelsea received additional funding from the University of Reading and the British Ecological Society.

Global hotspots of the origin of naturalized flora.

Alessandra Kortz[1], David M. Richardson[1,2], Wayne Dawson[3], Franz Essl[4], Bernd Lenzner[4], Holger Kreft[5,6], Jan Pergl[1], Mark van Kleunen[7,8], Patrick Weigelt[5,6], Marten Winter[9], Petr Pyšek[1,10]

(1) Institute of Botany, Czech Academy of Sciences, Department of Invasion Ecology, Zámek 1 252 43, Průhonice, Czech Republic
(2) Centre for Invasion Biology, Stellenbosch University, Department of Botany and Zoology, Natural Sciences, Merriman Ave, Stellenbosch Central, 7600, Stellenbosch, South Africa
(3) Durham University, Department of Biosciences, South Road, Durham, DH1 3LE, Durham, United Kingdom
(4) University of Vienna, Department of Botany and Biodiversity Research, Division of Bioinvasions, Global Change & Macroecology, Rennweg 14 1030, Vienna, Austria
(5) University of Göttingen, Biodiversity, Macroecology & Biogeography, Büsgenweg 1, 37077, Göttingen, Germany
(6) Centre of Biodiversity and Sustainable Land Use (CBL), University of Goettingen,, Büsgenweg 1, D-37077, Göttingen, Germany
(7) Ecology, University of Konstanz, Department of Biology, Universitätsstrasse 10, D-78464, Konstanz, Germany
(8) Zhejiang Provincial Key Laboratory of Plant Evolutionary Ecology and Conservation, Taizhou University, Taizhou 318000, Taizhou, China
(9) German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Puschstraße 4, 04103, Leipzig, Germany
(10) Charles University, Department of Ecology, Faculty of Science, Viničná 7 CZ-12844, Prague, Czech Republic

Recently compiled global databases have made an impressive contribution to our understanding of alien, naturalized and native plant species distributions. Here, we take a new perspective by focusing on the areas where species known to occur as aliens somewhere in the world are native, to identify the hotspots where alien species are generated. We analysed the 16421 naturalized plant species listed in GloNAF 2.0 (www.glonaf.org) (van Kleunen et al., Ecology 2019) and identified their native ranges according to POWO (https://powo.science.kew.org) (Govaerts et al., Scientific Data 2021). Preliminary results indicate that temperate Asia is the continent harbouring the highest diversity of plants that have become naturalized elsewhere (donating 37.7% of the global naturalized flora), followed by Africa (27.6%), Europe (27.4%) and Northern America (26.4%). At the finer scale, referring to 921 regions (GIFT, https://gift.uni-goettingen.de/) (Weigelt et al., Journal of Biogeography 2020) covering over 80% of the globe, all top ten regions generating the largest number of naturalized species are in Europe, each hosting at least ~2000 native species that have naturalized somewhere else. By focusing on environmental factors and considering the evolutionary history of the donor regions, we were able to test which factors define the naturalization/invasion foci and explore the correspondence of donor-acceptor regions globally. The aspects of invasions dealt with in our contribution, which were largely neglected at this scale so far, enhance our understanding of the factors shaping to the global distribution of alien species.

Keywords: native range, global databases, alien species distribution

Potential hotspots for plant invasions in northern Canada.

Peter Kotanen[1]

(1) University of Toronto, Ecology and Evolutionary Biology, 3359 Mississauga Road, Mississauga, Canada

Invasions by non-native plants are frequent in temperate regions, but rapidly decline with distance from the equator. This pattern is beginning to change as non-native plants are establishing at high latitudes in both the Northern and Southern Hemispheres. Limited information yet exists concerning invasions in remote northern Canada, but it is known that invaders occur in northern boreal and treeline habitats in the Hudson-James Bay regions. In the James Bay frontier of Ontario, the boreal forest towns of Moosonee and Moose Factory host numerous exotics, likely reflecting rail and shipping connections with southern Canada (and formerly with Europe). Some of these species have spread to the uninhabited Akimiski Island, in James Bay. Remarkably, more than 100 non-native plants also have been recorded much further north in the Hudson Bay town of Churchill, Manitoba, again likely reflecting this town's history as a rail link and grain port. Most of these plants are not arctic or subarctic in origin, but instead are widespread in temperate regions. Some do not produce viable seed; instead, soil translocation may explain their local spread. Observation and historical evidence suggest that non-native plants currently are unable to establish or persist in nearby tundra and treeline ecosystems, but instead depend upon anthropogenic habitat disturbance, soil enrichment, and/or artificial microhabitats. It is unclear whether this dependence will persist. The Arctic currently is warming at four times the global average; sites like this may become future hotspots for invasions.

Keywords: arctic, climate change, latitude

Considerations for developing and implementing a safe list for alien taxa.

Sabrina Kumschick[1,2], Laura Fernandez Winzer[1,2], Emily McCulloch-Jones[1,2], John Wilson[1,2]

(1) Centre for Invasion Biology, Department of Botany and Zoology, Stellenbosch University, Private Bag X1, Stellenbosch, South Africa
(2) South African National Biodiversity Institute, Kirstenbosch Research Centre, Cape Town, South Africa

Alien species have many uses, but some are also very damaging to the environment and economies in recipient countries. Options to address this dilemma are to develop lists of either taxa to be avoided (e.g., prohibited), or taxa of low risk. Here we unpack the second option, which we dub "safe list". A safe list of alien taxa is defined as "a list of taxa alien to the region of interest which are considered of sufficiently low risk of invasion and impact that the taxa can be widely used without concerns of negative impacts." A safe list of alien taxa should clearly specify the intended scope (e.g., which taxonomic groups or for which purposes the taxa are to be used). It is inherently an attempt to balance the need to preserve individual freedoms and to reduce the risk of damaging invasions. We discuss the potential use of safe lists in the management of biological invasions. Furthermore, we disentangle aspects related to the purpose, development, implementation, and impact of safe lists, and ultimately provide guidance for stakeholders and industries who may consider developing and implementing such lists.

Keywords: Green list, positive approach, White list

Native herbivores rapidly evolve to utilise invasive host plants.

Jaco Le Roux[1], Dylan Geraghty[1], Scott Carroll[2], Rachael Dudaniec[1]

(1) Macquarie University, School of Natural Sciences, North Ryde, Sydney, Australia
(2) University of California Davis

Direct interactions with invasive plants can lead to rapid evolution in native species. Soapberry bugs in the genus *Leptocoris* exemplify how such ongoing adaptation is shaping early *Anthropocene* ecosystems. As herbivores of plants in the soapberry family Sapindaceae, these insects have colonised, and adapted to, various invasive soapberry plants around the world. In Australia, the invasive balloon vine, *Cardiospermum grandiflorum* have been colonised by native soapberry bugs. We re-examine the evolution of longer mouthparts in bugs feeding on the balloon vine, which functions to reach balloon vine seeds found in inflated fruit capsules of this host plant. We also report on the genetic differentiation between an ancestral-type bug population (i.e., those still feeding on the native host, *Alectryon tomentosus*) and a derived population (i.e., feeding on invasive balloon vine). To investigate whether these populations have developed reproductive isolation we conducted a breeding experiment to compare the fitness of the two 'parental' populations to that of a 'hybrid' lineage. Despite low population genetic differentiation between ancestral and derived populations we found evidence for the evolution of incipient reproductive isolation between them. Specifically, hybrid bugs had lower fitness than *A. tomentosus* bugs, but similar fitness to *C. grandiflorum* bugs. We discuss our results in the light of utilising native soapberry bugs as biocontrol agents of invasive balloon vine in Australia.

Keywords: rapid evolution, plant-insect interactions, native biological control

Your weed, my Instagram selfie! Invasive alien plants that 'improve' the landscape Tourists and the tourism industry challenging the control of charismatic invasive plants in Aotearoa New Zealand.

Brent Lovelock[1], Stu Hayes[1], Anna Carr[1], Yun Ji[1]

(1) University of Otago, Tourism, Otago Business School, PO Box 56, Dunedin, New Zealand
*Corresponding author: brent.lovelock@otago.ac.nz

Management of invasive plants is as much a social problem as it is an ecological problem. This is because many invasive plants are perceived to have some positive value by stakeholders. This study explores the social contract for ongoing control of invasive plants in Aotearoa New Zealand, with an emphasis on the views of tourism stakeholders. We focus on two invasives; Russell lupin ((*Lupinus polyphyllus*) and wilding conifers (*Pinus spp, Larix decidua, Pseudotsuga menziesii*). Russell lupin invades riverbeds, displacing birds while providing cover for their predators. Wildling conifers invade native grasslands, transforming them to tall forest, reducing biodiversity, altering landscapes and water regimes, while increasing fire risks. We utilise data from a visitor survey (n=238), and an analysis of social media (Instagram) representations of Russell lupin. The data revealed low awareness of the invasive status of these species and their impacts. There was also a high level of acceptance of the presence of Russell lupins, largely because of their attractive flowers, which are exploited by the local tourism industry to draw visitors to the area. Tolerance for wilding conifers was lower, but some study participants appreciated their presence in the landscape, and also drew attention to the carbon-sequestering role of conifer trees. We discuss these findings in relation to the concept of invasive species denialism and suggest that there is a need for the tourism industry to be more proactive in alerting its stakeholders (tourists and tourism businesses) to invasive plants and their impacts, and involving them in control programmes.

Keywords: Russell lupin, Wildling conifers, Tourism.

Royal Society of New Zealand Te Apārangi Marsden Fund

Weed Wide Web: the trade of invasive plants online.

Jacob Maher[1]

(1) The University of Adelaide, Ecology & Evolutionary Biology, Biological Sciences, 230 North Tce, Adelaide, Australia

The ornamental plant trade is a major introduction pathway of invasive alien plant species. Trade facilitated via the internet (i.e., e-commerce) has expanded the variety of species available and extent of this introduction pathway. Many of e-commerce websites routinely trade invasive species. Without appropriate intervention the spread of invasive alien plants from e-commerce will continue. To address this issue, we investigated the trade of invasive plant species on a popular e-commerce website in Australia. Our aim was to quantify and describe the trade to better understand trade dynamics and participant motivations. We developed a semi-automated method of detection using a web scraper to collect online plant advertisements. We analysed 10,000 advertisements across a 12-month period. We focussed on detecting species that are prohibited to trade in Australia jurisdictions (i.e., illegal to trade in states and territories) due to their current or potential biosecurity impact. We found 155 prohibited invasive plant taxa traded in 1,418 ads. Opuntia cacti and invasive aquatic plants were the most frequently traded plants. Australia's strict internal biosecurity regulations did not appear to stop the trade of regulated invasive plant species advertised online. We suggest public awareness and education are key areas to focus on in addressing this issue. Increased monitoring and regulation of e-commerce websites is certainly warranted and we should also seek greater cooperation from e-commerce websites. We recommend coordinating national and international policies on plant trade to reduce the spread of invasive alien plant species globally.

Keywords: internet, trade, illegal

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Effects of the control of an invasive tree on the structure of a plant-frugivore network.

Brisa Marciniak de Souza[1], Nivaldo Peroni[1], Anna Traveset[2], Michele de Sá Dechoum[1]

(1) Universidade Federal de Santa Catarina, Departamento de Ecologia e Zoologia, Programa de Pós-graduação em Ecologia, Florianopolis, Brazil
(2) Mediterranean Institute of Advanced Studies, CSIC-UIB, Esporles, Spain

Invasive non-native species are one of the main causes of degradation of ecosystems worldwide. The control of invasive species is key to reduce threats to ecosystem viability in the long-term. The structure of ecological interaction networks has considerable potential in the management of ecological restoration processes. We evaluated the structure of plant-bird frugivory interaction networks in a plant community invaded by the guava tree (*Psidium guajava* L.) by comparing network metrics before and after control actions. *Psidium guajava* was relevant in all metrics for the unmanaged network in this study, with high degree centrality and high nestedness contribution. Based on the asymmetry of species interactions, we found that birds were highly dependent on the invasive plant. Once *P. guajava* trees were eliminated, bird and plant species richness, total number of interactions, and modularity increased, whereas nestedness and interaction strength asymmetry decreased. The diet of the bird community became more diversified once *P. guajava* was no longer available and important species roles in community structure emerged. Our results corroborate the fact that ecological restoration interventions should include the control of non-native plant species that attract frugivorous animals in order to diversify plant-frugivore interactions and thus maintain biodiversity in natural ecosystems.

Keywords: ecological interactions, ecological restoration, protected area

Testing alternative strategies for management of invasive alien tree species at the expansion front through individual based modelling.

Priscila Ana Powell[1], Lia Montti[1,2], Stephen C.F. Palmer[3], David Buslem[3], Justin Travis[3], Aurore Ponchon[4]

(1) 4Instituto de Ecología Regional (IER), Universidad Nacional de Tucumán (UNT) & Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Edificio de Las Cupulas, Horco Molle, Tucuman
(2) Instituto de Investigaciones Marinas y Costeras (IIMyC), FCEyN, Universidad de Mar del Plata, Mar del Plata, Argentina
(3) University of Aberdeen, School of Biological Sciences, Aberdeen, Scotland
(4) IMBE, Université Aix-Marseille, Marseille, France
*Corresponding author: priscilaapowell@gmail.com

The mitigation of negative impacts of invasive alien species (IAS) through management is a major challenge worldwide. Predicting and preventing IAS range expansions is a global conservation objective but empirical knowledge on how different management strategies affect invasion outcomes is limited. Individual-based models (IBMs) provide potential tools for predicting which of a set of alternative potential management strategies is likely to be most effective. Here we used a customized version of Range-Shifter, an individual-based spatially explicit modelling platform to simulate the results of different control methods on the population dynamics and range expansion propensity of an already established population of the invasive tree *Ligustrum lucidum*. We tested which life stages were targeted by control, how many sites were targeted and where those sites were located and how changing strategy over time affected outcomes. Results indicate that controlling all life stages is essential for effective management of *L. lucidum.* However, a strategy that switches after five years from controlling all stages to focusing exclusively on early life stages can be effective. Our findings illustrate how IBMs can be used to test different methods to control IAS populations in the invaded range. This approach can contribute for IAS management planning, reducing time and costs in fieldwork and/or identify limitations on successful invasive species control, due to allow simulating multiple strategies and considering their potential outcomes at both population and landscape level when addressing IAS.

Keywords: Individual-based model, Invasion containment, *Ligustrum lucidum*.

NERC-CONICET

Plant invasions in habitats: a big picture.

Petr Pyšek[1,2], Alessandra Kortz[1], Josef Brůna[3], Jan Čuda[1], Desika Moodley[1], Ana Novoa[1], Jan Pergl[1], Pavel Pipek[1], Kateřina Štajerová[1], SynHab Contributors[1], Martin Hejda[1]

(1) Department of Invasion Ecology, Institute of Botany, Czech Academy of Sciences, Průhonice, Czech Republic
(2) Department of Ecology, Faculty of Science, Charles University, Prague, Czech Republic
(3) Department of GIS and Remote Sensing, Institute of Botany, Czech Academy of Sciences, Průhonice, Czech Republic
*Corresponding author: pysek@ibot.cas.cz

Recent databases on alien species distributions mostly summarize information from regional checklists and ignore habitat affiliations of taxa naturalized or invasive in a given region because such information is not readily available in a standard manner. Yet there is robust evidence in the literature that habitats play a key role in determining global naturalization patterns. To overcome this constraint to a deeper understanding of the macroecology of plant invasions, we built the SynHab database, resulting from the project "Macroecology of plant invasions: a global synthesis across habitats" (www.synhab.com). The SynHab project summarized available data on distributions of naturalized plant species in different habitats, representing specific vegetation types in regions of the world. The habitat classification is based on 12 categories that are broad enough to accommodate vegetation across biomes and world regions (Pyšek et al., Preslia 94:477–577, 2022). SynHab database contains 91 datasets from all continents at the resolution of countries and includes ~7952 plant species, meaning that some information on habitats is available for 57.0% of the known world's naturalized taxa included in the GloNAF database (van Kleunen et al., *Ecology* 100:e02542, 2019). Here we present the numbers and proportions of alien species per habitat globally and explore how the patterns differ with regard to world continents and biomes, reflecting climatic conditions, regional land use, and the stage of invasion. The SynHab database will allow us to test key hypotheses in invasion biology, increase our understanding of mechanisms acting in specific habitats, and make predictions about future invasions.

Keywords: plant invasion, habitat, global scale.

Scenario-based games to improve the management of biological invasions.

Wolf-Christian Saul[1,2,3], Colin Farrell[4], David Farrell[4], Franz Essl[5], Leandra Heinrich[1], Sophia Kimmig[1,2,3], Guillaume Latombe[5,6], Bernd Lenzner[5], Cristian Pérez-Granados[7], Núria Puig Segura[8], Núria Roura-Pascual[8], Kris Tsenova[4], Jonathan M. Jeschke[1,2,3]

(1) Free University Berlin, Institute of Biology, Königin-Luise-Str. 1-3, 14195 Berlin, Germany
(2) Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB), Müggelseedamm 301, 12587 Berlin, Germany
(3) Berlin-Brandenburg Institute of Advanced Biodiversity Research (BBIB), Königin-Luise-Str. 2-4, 14195 Berlin, Germany
(4) Paidia Consulting Ltd., 64 Southwark Bridge Road, London SE19A, United Kingdom
(5) University of Vienna, Department of Botany and Biodiversity Research, Division of BioInvasions, Global Change & Macroecology Group, Rennweg 14, 1030 Vienna, Austria
(6) The University of Edinburgh, Institute of Ecology and Evolution, King's Buildings, Edinburgh EH9 3FL, United Kingdom
(7) University of Alicante, Department of Ecology, 03690, Alicante, Spain
(8) Universitat de Girona, Departament de Ciències Ambientals, Facultat de Ciències, 17003, Girona, Catalonia
*Corresponding author: wcsaul@gmx.net

Developing effective management strategies for invasive alien species (IAS) requires engaging a diverse group of stakeholders, including managers, policymakers, scientists and the general public. Game-based approaches have emerged as a promising tool for enhancing stakeholder engagement and improving decision-making processes. We developed two applied games about IAS management that consider future social-ecological developments: a role-playing game specifically targeted at stakeholders to stimulate co-design of management strategies, and a board game for the general public to raise awareness about IAS impacts and constraints affecting IAS management. Players assume different roles (e.g. representatives of environmental agencies or animal rights groups) and either develop their own management ideas (role-playing game) or experience a variety of predefined challenges and actions (board game). Both games build on four future scenarios of biological invasions in Europe that were co-created together with stakeholders and consider diverging political, socio-economic and environmental trajectories until 2050. Variations of the games exist in which different focal IAS (currently Asian hornet, Common ragweed, Marbled crayfish and Raccoon) can be targeted by the players. We use the example of raccoons in Europe to illustrate the games' course of action in more detail, but the games can be adapted to virtually any IAS and region. We believe there is strong potential of this participatory gamification approach for improving IAS management under future uncertainties captured by invasion scenarios.

Keywords: co-design, gamification, invasion scenarios.

When roses go rogue: Expanding ranges of invasive Rosaceae in South Africa.

Sandy-Lynn Steenhuisen[1], Grant D. Martin[2,3], Karabo Thato Moloi[1], Lehlohonolo Donald Adams[4], Stephanie Payne[1], Onalenna Gwate[6], Patricia Masole[1], Lesego Malekana[1], Colleen Downs[5], Vincent Ralph Clark[6]

(1) University of the Free State, Afromontane Research Unit and Department of Plant Sciences, Faculty of Natural and Agricultural Sciences, Qwaqwa campus, Kestell Road, 9866, Phuthaditjhaba, South Africa
(2) University of the Free State, Afromontane Research Unit and Department of Zoology and Entomology, Faculty of Natural and Agricultural Sciences, Qwaqwa campus, Kestell Road, 9866, Phuthaditjhaba, South Africa
(3) Rhodes University, Centre for Biological Control, Department of Zoology and Entomology, Faculty of Science, African Street, 6140, Makhanda, South Africa
(4) University of KwaZulu-Natal, South African National Biodiversity Institute and Centre for Functional Biodiversity, School of Life Sciences, Faculty of Science and Agriculture, Scottsville, 3209, Pietermaritzburg, South Africa
(5) University of KwaZulu-Natal, Centre for Functional Biodiversity, School of Life Sciences, Faculty of Science and Agriculture, Scottsville, 3209, Pietermaritzburg, South Africa
(6) University of the Free State, Afromontane Research Unit and Department of Geography, Faculty of Natural and Agricultural Sciences, Qwaqwa campus, Kestell Road, 9866, Phuthaditjhaba, South Africa
*Corresponding author: steenhuisens@ufs.ac.za

Invasive fleshy-fruited Rosaceae are becoming problematic in the grasslands and mountains of South Africa, where they can have severe impacts. Here we review current and ongoing research into the expansion of these species.

Plant reproductive ecology experiments have been conducted on a number of the most problematic invasive Rosaceae species. These have included determining seed production, soil seed banks, aviary feeding experiments with frugivorous birds, camera trapping and observations to determine frugivores in the field, and faecal seed counts. To determine altitude and climate impacts on their survival and growth, Rosaceae species were translocated and planted in both natural vegetation and in open top chambers at low and high altitude sites to represent future climate warming scenarios. Results show that these species produce millions of seeds/m2 invasion, which are long-lived in the soil. Fruits are eaten and dispersed by animals and different Rosaceae species appear dependent on different guilds of frugivores. Larger bird species, eland and baboons were highlighted as potential long distance dispersers. Transplant experiments show that these species are able to survive at high altitudes up to 3100 masl and future climates may favour their spread into mountain ecosystems.

These invasive Rosaceae species possess several reproductive traits that make them formidable invaders and difficult to manage. More study is needed to understand all factors involved in exacerbating spread in warmer climate scenarios as climate change experiments suggest the entire altitudinal range of the Drakensberg Mountain system is suitable for the establishment of these invasive Rosaceae.

Keywords: seed dispersal, climate change, grassland biome.

We acknowledge funding from DSI-RVSC, BiodiverSA-Horizon grant, Afromontane Research Unit, Centre for Biological Control, NRF and UFS research office; and support from Witsieshoek Mountain Lodge, Duncan Martin, and Clarens Conservancy.

Limits to plant invasions at the edge of the Arctic.

Vicki M. Zhang[1], Peter M. Kotanen[1]

(1) University of Toronto, Ecology & Evolutionary Biology, Arts & Science, 25 Willcocks St, Toronto, ON M5S 3B2, Toronto, Canada

Invasions by non-native plants are a widespread and serious problem throughout temperate regions, but the tundra and taiga ecosystems remain relatively uninvaded. Churchill, Manitoba (58ºN), at the edge of the tundra, represents a unique study site for northern invasions research: over a hundred non-native plants have been recorded within the town footprint and associated areas. While some invasive species have persisted for decades in these human-disturbed areas, none has spread into nearby subarctic tundra ecosystems. It is unclear why these non-native species have failed.

We are using a series of field experiments and sampling methods to test the effects of various potential barriers to northern invasions. Current results show that soils collected from invaded areas contain a high proportion of non-native seeds. Non-native species had low survival and performance when transplanted into the tundra; however, transplants performed better in the boreal forest. Additionally, some non-native species performed better when transplanted with soil collected from previously invaded sites.

These results suggest that belowground factors may play an important role in invasion, and soil movement may potentially contribute to local persistence and spread. There is also evidence that requirements to invasion success are not met in the tundra, but boreal forests are more susceptible to invasions. However, if invasion barriers are removed (i.e., soil is moved for construction, temperatures or soil nutrients are increased), there is a risk of non-native species invading from human-disturbed areas into the surrounding tundra.

Keywords: non-native plants, subarctic, biological invasions.

Mainstreaming Information on Invasive Alien Species (IAS): The Latin America and Caribbean National Database Network.

Silvia Ziller[1], Sergio Zalba[2], Ernesto Brugnoli[3], Marcelo Iturburu[4], Suzanne Davis[5], Eduardo Chacón-Madrigal[6], Felipe Espinoza[7], Rafael García[8], Lilian Florencia Ferrufino-Acosta[9], Hugo del Castillo[10]

(1) The Horus Institute for Environmental Conservation and Development, Servidao Cobra Coral 111, Campeche, Florianopolis, Brazil
(2) Universidad Nacional del Sur, Departamento de Biología, Bioquímica y Farmacia, Bahía Blanca, Argentina
(3) Universidad de la República, Montevideo, Uruguay
(4) Ministerio del Ambiente, Montevideo, Uruguay
(5) Institute of Jamaica, Jamaica Clearing-House Mechanism, Natural History Museum of Jamaica, Kingston, Jamaica
(6) Universidad de Costa Rica, Centro de Investigaciones en Biodiversidad y Ecología Tropical, San José, Costa Rica
(7) Instituto Nacional de Biodiversidad, Quito, Ecuador
(8) Universidad de Concepción, Instituto de Ecología y Biodiversidad (IEB), Concepción, Chile
(9) Universidad Nacional Autónoma de Honduras, Escuela de Biología, Facultad de Ciencias, Tegucigalpa, Honduras
(10) Asociación Guyra Paraguay, Asunción, Paraguay
*corresponding author: szillerf@institutohorus.org.br

During the 2000s the Interamerican Biodiversity Information Network (IABIN) was the first effort to systematize data on IAS in Latin America and the Caribbean, establishing fourteen active national databases between 2005 and 2011. Most were discontinued over time, except Argentina, Brazil, and Jamaica. In 2020, the network began to be rebuilt with support from the BioBridge Initiative (UN-CBD). Design and programming were updated, data fields added, and CBD standards adopted for pathways (Harrower et al. 2018), environmental (EICAT) and socio-economic impacts (SEICAT). The system became more user-friendly and is maintained in English, Portuguese, and Spanish. Data is available on the biology and ecology of species, impacts on biodiversity, health and the economy, risk assessments, EICAT/SEICAT results, pathways and vectors, management options, places of occurrence, references, data providers, and projects. Standards for data validation were established. A cell phone application was developed to facilitate data collection in the field. While the Argentina (772 species) and Brazil (487 species) databases were updated and have been running since 2005, Paraguay, Uruguay (375 species compiled since 2006), and Ecuador (67 species since 2022 in the Amazon region) databases were relaunched in 2021-2022; Jamaica is being updated (86 species since 2007); Chile, Costa Rica, and Honduras (now compiling data) will be relaunched in 2023. While each country manages its own independent information system, common standards are maintained. A continental network is being constructed to offer reliable data free of charge, filling a significant regional gap to support decision-making in the management of biological invasions.

Keywords: database, management data, open access.

Flash Talks

Impacts of invasive plants on vegetation in protected areas of Nepal.

Suneeta Bhatta[1,2], Martin Hejda[1], Petr Pyšek[1,2]

(1) Institute of Botany, The Czech Academy of Sciences, Department of Invasion Ecology, CZ-252 43, Průhonice, Czech Republic
(2) Charles University, Department of Ecology, Faculty of Science, Viničná 7, CZ-128 44, Prague, Czech Republic

Invasive alien plants are well recognized for biodiversity loss, habitat degradation and health problems. Protected areas are expected to harbour fewer invasive plants due to the absence of anthropogenic disturbance. Our study aimed to quantify the impacts of selected invasive plants on native species richness, diversity, and composition in five protected areas of Nepal, located at the Himalayan foothill, and compare which species had stronger impacts. *Lantana camara, Parthenium hysterophorus* and *Mikania micrantha* were selected as target species based on their abundance in the study area. For each species, 30 pairs of invaded and uninvaded plots of 10×10 m was sampled to quantify the impacts. The impacts of all three invasive plants together and individually were analyzed using hierarchical linear mixed models and factorial linear models, respectively. Direct gradient analysis was performed to test the differences in plant community composition between the invaded and uninvaded plots. The analysis of data merged for all studied invaders showed that the invasions declined species richness and diversity in protected areas of Nepal. Native species richness decreased to less than a half in the invaded plots. Similarly, each of the three species analyzed separately had a significant negative impact on the species richness of invaded plots, with *M. micrantha* having the greatest impact, followed by *P. hysterophorus* and *L. camara*. More interestingly, the impact of *L. camara* and *M. micrantha* on species richness varied among protected areas. The study supports the invasion meltdown theory, as other invasive species were recorded in the invaded plots.

Keywords: anthropogenic, invasion meltdown, protected areas

Biogeography, taxonomic structure, and ecological impacts of alien plants in Nigeria.

Israel Borokini[1], Alessandra Kortz[5], Quadri Anibaba[2], Arne Witt[3], Emmanuel Aigbokhan[4], Martin Hejda[5], Petr Pyšek[5,6]

(1) University of California, Berkeley, Department of Integrative Biology, College of Letters and Science, Berkeley CA, United States
(2) Polish Academy of Sciences, Institute of Dendrology, Poland
(3) CABI, Nairobi, Kenya
(4) University of Benin, Department of Plant Biology & Biotechnology, Benin City, Nigeria
(5) Czech Academy of Sciences, Department of Invasion Ecology, Institute of Botany, CZ-252 43, Průhonice, Czech Republic
(6) Charles University, Department of Ecology, Faculty of Science, Viničná 7, CZ-128 44, Prague, Czech Republic

We compiled a checklist of alien plants in Nigeria from several floristic records and questionnaire administration to local botanical gardens. The list comprises 1,381 alien plants, which were further classified into cultivated, naturalized, and invasive plants (hereafter 'ecological status'). We then used chi-squared tests to investigate potential significant association between the ecological status of the naturalized and invasive plants and their life form, biogeographical realm of origin, residence time, local distribution, and local economic uses. We also conducted random forest model to identify attributes that facilitate naturalization between the naturalized and non-naturalized alien plants. The 1,381 taxa include 953 cultivated species, 238 naturalized, and 190 invasive plants in Nigeria. The 428 naturalized and invasive plants spread across 270 genera and 91 families, with Fabaceae and Poaceae having the highest representation. Chi-squared tests reveal nonrandom distribution of life forms among the naturalized and invasive alien plants ($p<0.001$), with herbaceous life form having the highest representation. We also observed a significant representation of naturalized and invasive plants from the Indomalaya ($p=0.006$) and the Neotropics ($p=0.04$). Most of the naturalized and invasive plants were introduced during the British colonial rule, they are located in urban ruderal and agricultural habitats, and are notably used for various local economic purposes. The random forest model confirms the contribution of life form and local economic uses to the naturalization of alien plants in Nigeria. This checklist provides baseline information on plant introductions and invasions in Nigeria, allowing for further applied ecological investigations.

Keywords: invasive species, Nigeria, naturalization

of *Pinus radiata* D. Don., in the context of native forest restoration in the foothills of Nahuelbuta, Chile.

Natalia A. Cáceres Novoa[1], Mauro González[1], Antonio Lara[1], Oscar Thiers[2], John Gajardo[2]

(1) Universidad Austral de Chile, Instituto de Conservación Biodiversidad y Territorio, Facultad de Ciencias Forestales y Recursos Naturales, Valdivia, Chile
(2) Universidad Austral de Chile, Instituto de Bosques y Sociedad, Facultad de Ciencias Forestales y Recursos Naturales, Valdivia, Chile

The magnitude of landscape transformations has serious consequences for ecosystem processes and functions. Given this, ecological restoration is increasingly used as a strategy to recover degraded ecosystems, with invasive species being one of the most critical barriers to restoring native ecosystems. In Chile, one of the main restoration challenges is the removal of trees of the invasive species *P. radiata* found in native forests. The objective of this study was to evaluate the effectiveness of different doses of herbicides for the control of *Pinus radiata* in native forest restoration areas using the NDVI of the canopy, foliage affectation and needle fall as indicators. To evaluate the effectiveness of different doses of herbicides, three doses of glyphosate and metsulfuron were applied, each one applied in three different stands, plus a control stand. To analyze the NDVI, it was calculated on a *P. radiata* mask before and after the application of the herbicides. For the analysis of the affectation of the foliage, a guideline associated with degrees of coloration was applied, and to analyze the fall of needles, litter collectors were installed in each of the treatments to estimate the loss of needles. The high doses of both products proved to be the most effective for the death of the *P. radiata* stands, reflected in the greatest decrease in vigor (NDVI), high percentage of foliage affectation and greater fall of accumulated needles throughout the period of assessment.

Keywords: Invasion control, Chemical method, Ecological restoration

Invasive alien species or tourist icons? Hop on in!

Anna Carr1, Brent Lovelock[1]

(1) University of Otago, Centre for Recreation Research/Department of Tourism, PO Box 56, Dunedin, New Zealand

IAS are of particular ecological concern in Aotearoa New Zealand (NZ). As a country renowned for its evolutionary isolation and invasive plants and animals now populate the country, impacting native ecosystems and the economy (Nimmo-Bell 2009). Many IAS have attained economic and cultural importance for instance as the focus of recreational pursuits including hunting and fishing or as an addition to scenic landscapes (Ansong & Pickering 2015). \From a tourism perspective other IAS are presented as symbolic icons or destination brands in regional tourism destinations, despite the same IAS posing a threat to endangered native species (Lovelock et al. 2023).

This paper presents qualitative research on the socio-cultural dimensions of IAS management by focussing on an introduced species – the wallaby. The Bennett's Wallaby was introduced from Australia in the 1870s for the fur trade. It This 'cute', charismatic' species has spread throughout tussock grasslands habitat in Otago and Canterbury. Recreational hunters have contributed to wallaby control but the increasing distribution and population has required an eradication programme. Yet in the town of Waimate wallaby are also a tourist attraction with several commercial or wild viewing opportunities. The local DMO promotes wallaby as tourist attraction whilst acknowledging the pest status. The wallaby has different values for different people. Tensions arise around the presentation of wallaby as an IAS in the township where the DMO and locals encourage visitors to hunt with either gun (or camera), or consume a Wallaby pie (depending on the ethical and emotional stance of each visitor).

Keywords: Invasives, Tourism, New Zealand

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Species' habitat niche strongly affects their global naturalization success.

Jan Čuda[1], Martin Hejda[1], Alessandra Kortz[1], Josef Brůna[3], Desika Moodley[1], Ana Novoa Pérez[1], Jan Pergl[1], Pavel Pipek[1,2], Kateřina Štajerová[1], Synhab Contributors[1], Petr Pyšek[1,2]

(1) Institute of Botany, Czech Academy of Sciences, Department of Invasion Ecology,, Zámek 1, Průhonice, Czech Republic
(2) Charles University, Department of Ecology, Faculty of Science, Viničná 7, Prague, Czech Republic
(3) Institute of Botany, Czech Academy of Sciences, Department of Geoecology, Zámek 1, Průhonice, Czech Republic

Although it has been established that habitat plays a key role in the naturalization of alien species, e.g., that more species succeed in ruderal than in other habitats, how species habitat niche affects its invasiveness remains insufficiently known. For example, species with a broad habitat niche may become more widespread due to their tolerance of various environmental conditions. To investigate this question, we used the SynHab database, resulting from the project "Macroecology of plant invasions: a global synthesis across habitats" (www.synhab.com), which includes data on the occurrence of ~8000 naturalized species in 14 habitat categories collected from 91 country-level regions all over the world. The information on the distribution in habitats was complemented, where available, with that on invasion status (naturalized or invasive, taken from the GloNAF database; van Kleunen et al., Ecology 100: e02542, 2019), climate, and residence time in the region (Seebens et al., Nature Communications 8: 14435, 2017) and species-specific traits (POWO 2023, www.plantsoftheworldonline.org). Preliminary results show that the number of habitats invaded by a species in each region depends on its residence time; the longer it is present, the more habitats it occupies. The number of invaded regions by a species is strongly positively related to the number of habitats it invades. The habitat specialists among naturalized aliens have limited distributions, always occurring in a few regions. The results were consistent across continents (Europe, Africa, Asia, South and North America) for which we had sufficient data to test these relationships.

Keywords: habitat, invasiveness, niche

Roads in the Chilean Andes: Consequences for Biodiversity and Microclimate.

Eduardo Fuentes-Lillo[1,2], Rafael Andrés García Araya[1,2], Alejandra Jimenez[1,2], Aníbal Pauchard Cortés[1,2]

(1)Laboratorio de Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile.
(2) Instituto de Ecología y Biodiversidad (IEB), Santiago, Chile

The Andes have a great biodiversity and provide numerous ecosystem services that enhance human well-being. However, global factors such as climate change, non-native species, and anthropogenic disturbances can cause significant changes in the taxonomic structure of plant communities and microclimate in the Chilean Andes. In this study, we investigated the impact of roads on microclimate, taxonomic homogenization, and redistribution of non-native plants along 12 roads distributed along altitudinal and latitudinal gradients (33°-56°S) in Chile. We used the T-MIREN methodology and species distribution models (SDMs) to quantify the impact of roads on microclimate and plant communities. Our results indicate that road presence increases soil temperature and humidity, as well as light availability and the richness of non-native plants compared to undisturbed areas. Based on the Jaccard index, homogenization decreases with elevation, whereas in lowland areas, homogenization is higher. Determining the percentage of explained variance, we found that road presence is the main factor determining taxonomic homogenization of plant communities in the Andes. Finally, in terms of spatial patterns, we observed a trend of invasive species redistributing towards higher elevations associated mainly with the presence of road networks. These results highlight the importance of roads as the main disturbance agent in mountains, promoting biodiversity loss and an increase in the presence of non-native plants.

Keywords: Biotic homogenization, redistribution, Non-Native species

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River degradation: what role do invasive plants play in riverbank erosion?

James Hardwick[1,2], Chris Hackney[1], **Zarah Pattison**[2,1]

(1) School of Natural and Environmental Science, Newcastle University, Newcastle upon Tyne, UK
(2) Biological and Environmental Science, University of Stirling, Stirling, FK9 4LA, Scotland, UK
*Corresponding author: zarah.pattison2@stir.ac.uk

River degradation through anthropogenic and climate related disturbances is a global challenge. Riverbank erosion is a major feature of degraded rivers which can lead to loss of land and sediment accumulation downstream often linked to flooding. Native riparian vegetation can reduce riverbank erosion by providing structural reinforcement through a network of below-ground roots and above-ground biomass. However, numerous global threats face river systems and native riparian vegetation including channel modifications that drive riparian zone perturbations. Invasive alien plant species (IAPs) can benefit from these riparian zone perturbations, utilising the same river processes that maintains high biodiversity of native riparian vegetation. Marked changes in riverbank erosional regimes, have been associated with IAPs rapid proliferation into riparian zones. Species such as Impatiens glandulifera (Himalayan Balsam) and Heracleum mantegazzianum (Giants Hogweed) are often associated with riverbank erosion. Yet, the degree of riverbank erosion modulation by IAPs and their effects on riverbank stability remains unclear, with little evidence in the scientific literature. In this study we assess the role of IAPS in modulating riverbank erosion across lowland UK rivers. Using a range of methods we aim to disentangle the impact of IAPs on riverbank erosion, enabling tighter constraints to be placed upon the biogeomorphic role IAPs play in river systems.

Using citizen-science photos to track the phenology of invasive species.

Yves Klinger[1], R. Lutz Eckstein[2], Till Kleinebecker[1]

(1) Justus Liebig University Giessen, Landscape Ecology, Heinrich-Buff-Ring 26-32, 35392 Gießen, Germany
(2) Karlstad University, Department of Environmental and Life Sciences, Biology, Karlstad, Sweden

Phenology explores the timing of recurring biological events (such as bud burst, flowering, and fruiting), their causes, and the relation among phases within and between species. When species are introduced to new regions, they are confronted with new environmental conditions. Phenology may be key for understanding what makes species invasive, as a range of factors driving species interactions and competition for resources are tied to their timing. For plants, the capability to reach key phenological stages under differing climates can be considered a prerequisite to persist across geographical ranges and strongly shapes interactions with native communities. For example, the timing of resource acquisition is tied to the beginning (budburst) and the end (senescence) of a species' phenological cycle, the timing of flowering influences the availability of pollinators, and the timing of fruiting determines competitiion for potential dispersal vectors. Furthermore, the timing of effective IAS management is often linked to a species' phenology.

Despite their importance, phenological studies on invasive species are still relatively rare, in particular for herbaceous plants. The recent upsurge in publicly available photos collected by citizen scientists is a valuable source of phenological data for many species. Using citizen-science photos, we investigate the timing of key phenological events of several widespread IAS across Europe. To this end, we explore the spatio-temporal patterns of flowering and fruiting and analyze climatic drivers of phenological events. We show how citizen-science photos can complement existing phenological studies on IAS and present future prospects of the approach.

Keywords: phenology, iEcology, plant invasion

Differences in entomofauna assemblages associated with Eucalyptus sp.pl.: could this help explain why only a limited number of species have naturalized in the Mediterranean?

Vanessa Lozano[1,2], Arturo Cocco[1,3], Giuseppe Brundu[1,2]

(1) University of Sassari, Department of Agricultural Sciences, Viale Italia 39/A, 07100, Sassari, Italy
(2) National Biodiversity Future Center (NBFC), Palermo 90133, Italy
(3) Innovative Agriculture Research Center, University of Sassari, Sassari, Italy

The introduction of eucalypts in the Mediterranean has been accompanied by accidental introductions of insects from Australia associated with this genus. In addition, local entomofauna can adapt to feed on eucalyptus in many regions as eucalypts are widely used in forestry. According to the Enemy Release Hypothesis, a suggested mechanism for the success of introduced alien species, insect assemblages are expected to be diverse across the Eucalyptus sp.pl. found in the Mediterranean and to be slightly less abundant and diverse compared to the Eucalyptus in their native region. The aim of this study is therefore to survey whether the entomofauna assemblages show patterns consistent with predictions of the enemy release hypothesis. For this purpose, literature and expert-based data about the entomofauna associated with the genus Eucalyptus in its native range and across Mediterranean are being collected, and in particular data coming from one Eucalyptus sentinel garden (ca. 50 species) established in Sardinia. The sentinel garden is an increasingly widespread strategy tool for early identification of plant pests before they spread becoming a risk to other species. Moreover, it provides a unique opportunity to observe the development of new insect communities in Eucalyptus species introduced and established successfully in the Mediterranean. Additionally, sentinel gardens can reveal new insect-host plant associations and host shift of native insects.

Keywords: Eucalyptus, Entomofauna, Sentinel garden

Restoration as Biocontrol: Mass-Ratio or Diversity-Invasion Theory as Guiding Principle?

Kelly Lyons[1]

(1) Trinity University, Biology Department, One Trinity Place, San Antonio, USA

Climate change and invasive species present significant barriers to restoration. A primary question is whether land managers can use restoration for invasive species biocontrol engaging mechanisms of diversity, monocultures of high biomass species, or both. In this study, we assessed the effect of restored perennial, grassland species richness and composition on invasive species re-establishment in a calcareous, savannah ecosystem. The study also became a test of the effectiveness of restoration with climate change, as, during the establishment phase (2010-2011), Texas experienced widespread "exceptional drought" conditions. We hypothesized that invasive species re-establishment would be slowed at higher levels of restored species diversity and in plots with species with high initial biomass. We employed a two-way factorial experiment in a randomized complete block design where richness (1-4) and native species composition were manipulated. All possible species combinations were included at richness levels 2 and 3 with four replicate blocks. We found that suppression of the invasive species was greatest in monocultures of the dominant native species but that suppression at the four-species treatment level was on par. We also found that complementarity (diversity-invasion hypothesis) operated to reduce invasive species re-establishment and that the abundance and suppressive effect of the dominant species may be reduced at intermediate levels of richness (i.e. 1 and 2 species). Based on our results, best management practices utilizing restoration as biocontrol under drought recovery requires many years of post-implementation assessment. Furthermore, for any system, optimal monocultures and richness levels need be assessed.

Keywords: restoration, biocontrol, diversity

Financing: USDA AFRI

The bacteriome of Acacia longifolia: new insights into its seed and root-nodule communities.

Joana G. Jesus[1,2], Mónica Condessa[2], **Cristina Máguas**[1,2], Johannes J. Le Roux[3], Helena Trindade[1,2]

(1) Centre for Ecology, Evolution and Environmental Changes & CHANGE - Global Change and Sustainability Institute, Plant Biology, Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016, Lisbon, Portugal
(2) Universidade de Lisboa, Faculdade de Ciências, Campo Grande, 1749-016, Lisbon, Portugal
(3) School of Natural Sciences, Macquarie University, North Ryde, NSW, Australia

Plants harbour diverse microbiomes in their rhizo-, phyllo-, and endospheres. Also, other plant-associated microbes form tight-knot associations, like nitrogen-fixing rhizobia and most legumes. Altogether, this could confer important adaptative traits, with consequences for plant invasiveness.

Acacia longifolia Andrews (Willd.), native to Australia, is one of the most aggressive invaders worldwide, particularly in Mediterranean regions. It was introduced into Portugal for dune stabilization. However, its inherent characteristics, such as fast growth, massive seed production and increased post-fire germination, enabled dispersal beyond coastal dunes. Once *Acacia* sp. is described as promiscuous, recruiting several bacteria beyond rhizobia, this could assist its invasion.

We characterized endophyte and nodule bacterial communities of *A. longifolia* aiming to 1) identify the cultivable seed endophytes within native and invasive ranges; and 2) screen the root nodule bacteriomes from unburnt and burnt sites, using next generation sequencing.

Our bacterial isolations revealed different seed endophytic communities, with *Curtobacterium* sp. shared between ranges, with minor differences found among sites. Also, *Rhizobium* (i.e., rhizobia) was isolated only from one invaded site. Within nodules, the genus *Bradyrhizobium* was dominant in both sites, followed by Tardiphaga (Alphaproteobacteria) and *Synechococcus* (cyanobacteria). Non-rhizobial taxa are important components of root nodule communities.

The ability to harbour different partners in seeds, transmitted both vertical- and horizontally, could be advantageous for *A. longifolia* establishment in novel environments, incldluing a local adjustment. Additionally, plant development could be facilitated by recruiting rhizobia (not included among endophytes) and other non-rhizobial partners for nodulation. Thus, bacteriomes seem to play a key role in invasion success.

Keywords: endophytes; invasion; promiscuity

Financing: cE3c (Centre for Ecology, Evolution and Enviromental Changes) - UIDB/00329/2020

Testing novel applications of satellite imagery developed by Copernicus mission for tracing the effects of Ailanthus altissima invasion on natural ecosystems in a Mediterranean island.

Flavio Marzialetti[1,3], Maria Laura Carranza[2,3], Vanessa Lozano[1,3], Giuseppe Brundu[1,3]

(1) University of Sassari, Department ofAgricultural Sciences, Viale Italia 39/A, 07100, Sassari, Italy
(2) University of Molise, Envix-Lab, Departement of Biosciences and Territory, contrada Fonte Lappone, snc, 86090, Pesche (IS), Italy
(3) National Biodiversity Future Center (NBFC), Palermo, Italy

Invasive alien plants (IAPs) may promote substantial changes on invaded ecosystems and, occupying "empty" phenological niches left by natural, may alter ecosystem function (e.g. water stress, soil coverage).

Copernicus mission (European Space Agency) offers free remote sensing (RS) data, providing cost-effective, spatially contiguous, and timely data to improve ecological monitoring of invaded areas.

We explore the potential of Copernicus satellites (Sentinel-1, Sentinel-2, Sentinel-3) for describing ecosystem phenology and stress conditions on a Mediterranean island (Sardinia) invaded by *Ailanthus altissima*, a fast-growing invasive tree listed among the worst IAPs globally.

We selected a set of 1507 invaded locations in Sardinia (Italy) and compared their RS spectral variability during the year with 3000 random points inside not invaded natural habitats (woody and herbaceous according with EUNIS land cover map). We derived from spectral, radar and thermal reflectance information a wide set of multi-temporal RS variables depicting annual trends on vegetation biomass, photosynthetic activity, chlorophyll and carotenoid content, canopy structure, evapotranspiration, water use efficiency, drought stress and soil organic content.

Preliminary results highlighted significant differences on RS variables among invaded and not invaded woody stands. Invaded sites presented higher RS values over the year on carotenoid content and canopy moisture stress as well as higher soil organic content. Invaded sites showed lower values in biomass and water use efficiency, and an intermediate evapotranspiration.

Further analysis implementing improved algorithms linking field and remote sensed data will improve our understanding of *A. altissima* invasion process and its effects on ecosystem functioning.

Keywords: Invasive alien plants, Sentinels data, Multispectral radar and thermal images

Regulating fruity invasions—the South African experience.

Tumeka Mbobo[1,2], David M. Richardson[2,3], Arunava Datta[1,2,4], Katelyn T. Faulkner[1,5], John R. Wilson[1,2]

(1) South African National Biodiversity Institute, Kirstenbosch Research Centre, Cape Town, South Africa, South Africa
(2) Centre for Invasion Biology, Department of Botany and Zoology, Stellenbosch University, Stellenbosch, South Africa
(3) Institute of Botany, Czech Academy of Sciences, Průhonice, Czech Republic
(4) Department of Botany, The University of Burdwan, Burdwan, West Bengal-713104, India
(5) Department of Zoology and Entomology, University of Pretoria, Hatfield, South Africa

Blackberry, dragon fruit, guava, jambolan, loquat, mulberry, prickly pear, passionfruit, and tree tomato are grown commercially, in people's gardens, or their fruit are harvested from populations outside of cultivation. All of these taxa are regulated as invasive in South Africa, but all of these taxa also have exemptions from the regulations if fruit are used for human consumption. Does this appropriately balance the twin desires for fruit and a South Africa protected from the harm caused by biological invasions? We explored fleshy-fruited Myrtaceae invasions globally and in South Africa. Compared with dry-fruited Myrtaceae, fleshy-fruited species have naturalised more often but have become invasive relatively less often. We suggest this is due to fleshy-fruits allowing recruitment at sites that are suitable for naturalisation but that will not result in dense monocultures. Using *Psidium guajava* in South Africa as a case study, and building on observation data from field surveys and expert consultations, we built various species distribution models —for cultivation, for naturalisation and for invasions that are expected to have harmful impacts. We argue that regulation at a municipal level could limit impacts without meaning guava is regulated where the risk of impact is low. However, whether it will be practical to implement this remains to be seen. We suspect that guavas and other such plants will remain a fruity problem, but by improving the evidence-base for decision-makers might help us get out of the jam.

Keywords: invasive species management, niche dynamics, impact assessment

Financing: DSI-NRF Centre of Excellence for Invasion Biology and the South African Department of Forestry, Fisheries and the Environment (DFFE) for funding.

Lands of Indigenous People are less disturbed, less accessible, and harbour fewer alien species.

Laura Meyerson[1], Aidin Niamir[7], Franz Essla[2], Stephen Garnett[3], Joy Kumagar[4,7], Zsolt Molnar[5], Hanieh Saeedi[6], Hanno Seebens[7]

(1) University of Rhode Island, Natural Resources Science, College of Environmental Life Sciences, 9 East Alumni Avenue, Kingston, USA
(2) University Vienna, Department of Botany and Biodiversity, Macroecology Group, Rennweg 14, Vienna, Austrai
(3) Charles Darwin University, Research Institute for the Environment and Livelihoods, NT 0909, Casuarina, Australia
(4) Stanford University, Stanford, USA
(5) ELKH Centre for Ecological Research, 2163 Vácrátót, Hungary
(6) Senckenberg Research Institute and Natural History Museum, Senckenberganlage 25, Frankfurt, Germany
(7) Senckenberg Biodiversity and Climate Research Centre, Senckenberganlage 25, Frankfurt, Germany

Indigenous Peoples' lands play a vital role in the protection of nature worldwide despite pressures from anthropogenic threats such as biological invasions. Here we provide the first study detailing the distribution and drivers of alien species on Indigenous Peoples' lands globally. On average, Indigenous Peoples' lands host 70% fewer alien species relative to other lands. This lower prevalence of alien species is consistent across all taxa and continents even after accounting for the remoteness and higher ecological integrity of Indigenous Peoples' lands compared to other lands. These reduced alien species numbers may result from the different ways in which lands are managed by Indigenous Peoples. However, some Indigenous Peoples' lands host disproportionately higher numbers of alien species than other lands, likely caused by high alien species propagule pressure arising from close proximity to large urban areas.

Keywords: Invasive alien species, Indigenous Peoples Land, Alien species

Evolution of invasiveness in a hybrid knapweed complex post-introduction.

Jane Molofsky[1], Lindsey Milbrath[2], Zoe Portlas[1], Thomas Buckley[4], Malissa Christie[1], Neil Buckley[3], Stephen Keller[1]

(1) University of Vermont, Department of Plant Biology, 63 Carrigan Drive, Burlington, United States
(2) USDA-ARS Robert W. Holley Center for Agriculture and Health, Ithaca, United States
(3) State University of New York at Plattsburgh, Biology, 101 Broad Street, Plattsburgh, United States
(4) Princeton University, Princeton, United States
* Corresponding author: jane.molofsky@uvm.edu

Hybridization is an important mechanism for speciation in plants. However, hybridization can also create new hybrid species that are invasive even if the two parental species are not. Here we examine whether hybridization leads to invasiveness in a hybrid species complex that occurs in both its native range in Europe and in its introduced range in the United States.The hybrid species, meadow knapweed, *Centaurea moncktonii* results from the hybridization of two European native species (brown knapweed, *C. jacea* and black knapweed, *C. nigra*) and arises both in the native range in Europe and the introduced range in the United States.

We sampled individuals of this hybrid species complex from across its native range in Europe (Spain, France, and Norway) and in its introduced range (Pacific Northwest: Washington and Oregon; Northeastern US New York and Vermont). Using genotyping by sequencing (GBS) and admixture analysis, we assigned individuals to each species. In a common garden, we grew individuals from each species and compared the fitness and morphological traits for all individuals. We found that the hybrid individuals from the US were taller and had higher specific leaf area than EU hybrids. Higher values in both specific leaf area and height are associated with greater invasive behavior. However, for the two traits that most directly measure fitness (total flower number and total biomass), we found no difference between the US and EU hybrid individuals. Our results suggest that there has been selection for greater invasive traits post-introduction in this hybrid species complex.

Keywords: Evolution of invasion, Hybridization, Invasive traits.

Review of the invasive, yet economically beneficial, Rosa rubiginosa L. (Rosaceae) within southern Africa.

Stephanie Payne[1], Sandy-Lynn Steenhuisen[1], Karabo Thato Moloi[1], Patricia Masole[1], Gcinile Carvalho[1], Zinhle Sithole[1], Gerald Chikowore[2], Timothy Westwood[3], Moselantja Rahlao[4], Peter Chatanga[5], Lerato Seleteng-Kose[5], Grant Martin[6,7]

(1) University of the Free State, Qwaqwa Campus, Afromontane Research Unit and Department of Plant Sciences, Faculty of Natural and Agricultural Sciences, Phuthaditjhaba, 9866, South Africa
(2) University of the Free State, Department of Zoology and Entomology, Faculty of Natural and Agricultural Sciences, Bloemfontein, 9300, South Africa
(3) Rhodes University, Department of Economics and Economic History, Grahamstown, 6140, South Africa
(4) National University of Lesotho, Department of Animal Science, Roma, 180, Lesotho
(5) National University of Lesotho, Department of Biology, Roma, 180, Lesotho
(6) Rhodes University, Centre for Biological Control, Department of Zoology and Entomology, Grahamstown, 6140, South Africa
(7) University of the Free State, Qwaqwa Campus, Afromontane Research Unit and Department of Geography, Faculty of Natural and Agricultural Sciences, Phuthaditjhaba, 9866, South Africa

Invasive species usually have negative impacts on the environments they invade, but in some instances, they can prove to be beneficial. In southern Africa, *Rosa rubiginosa* is one such species. The plant is classified as a category 1B invasive under the National Environmental Management: Biodiversity Act of South Africa, as well as one of the most common invaders in Lesotho. It is responsible for bush encroachment in grasslands, decreasing available farmlands and reducing water availability, and potentially altering soil chemistry. *Rosa rubiginosa* is also a nurse plant for seedlings of other invasive species, and its fruit and seeds appear to be dispersed by native dispersers. A parasitic wasp predates seeds of *R. rubiginosa* and could be considered as a potential biocontrol agent. However, *R. rubiginosa* has become economically important in the region, providing employment for local women and children as its fruits are harvested from wild populations and exported for the production of commercial products such as herbal teas, fruit juices and cosmetics. Scientific experts, landowners and commercial industry have differing perceptions of *R. rubiginosa*. We discuss *R. rubiginosa* as a conflict-generating species through a review of its reproductive ecology, potential for biocontrol, and economic benefits within South Africa and Lesotho. The species is problematic for agriculture by deteriorating rangeland productivity and facilitating the establishment of other invasive species. However, more information is required before management decisions are made by authorities, to ensure effective use of the species while mitigating the risks of invasion and bush encroachment.

Keywords: Biocontrol, Grasslands, Reproductive Ecology

Financing: We acknowledge funding from the National Research Foundation of South Africa, University of the Free State, Afromontane Research Unit, Centre for Biological Control, Rhodes University and National University of Lesotho.

Ecological and functional trait-environment joint modelled responses of aliens and native plants of Marion Island.

Luis R. Pertierra[1], Michelle Greve[1], Michael Cramer[2], Peter Le Roux[1]

(1) University of Pretoria, Plant and Soil Sciences, Natural and Agricultural Sciences, Hillcrest, Pretoria 0083, Pretoria, South Africa
(2) University of Cape Town, Biological Sciences, Science, 20 University Avenue, Upper Campus, Rondebosch, Cape Town, Cape Town, South Africa

A joint species distribution model was used to analyze the vascular plant community of sub-Antarctic Marion Island to elucidate invasion patterns. We explore Darwin's naturalization conundrum by testing whether the invasive species tend to mirror the tolerances and trait responses expressed by the native communities in order to survive the prevailing conditions (habitat filtering hypothesis) or instead exhibit unique responses (empty niche hypothesis) in order to escape competition with natives. The rarity of species varied across plants but all of the alien species were moderately rare. Species richness decreased with altitude, and showed high richness in/around the ecotone from coastal zones and the biotic complex vegetal formation. Although alien species differ from natives in some of their habitat preferences and in the primary drivers of distributions, these patterns were not consistent between alien species. For example, while alien grasses consistently exhibited a negative distributional relationship with elevation, alien pearlworts were indifferent to changes in elevation. The community exhibited limited patterns of trait-environment responses, although some associations were observed. Specifically, plant height was influenced by geology, while increased elevation (and correspondingly decreased temperature) exhibited a negative relationship with specific leaf area. Additionally, higher wind exposure was linked to decreased SLA, whereas warmer temperatures were associated with increased leaf area. Species-to-species residual associations indicated a greater prevalence of positive associations between natives and between aliens pairs compared to alien-native pairs. This suggests that unmeasured environmental factors may be still missing, but also hint that plant-plant interactions could also be shaping their distributions.

Keywords: species distribution models, traits, environment

When habitats get sentimental: are invasive plants perceived differently in different environments?

Pavel Pipek[1,2], Ana Novoa Pérez[1], Alessandra Kortz[1], Martin Hejda[1], Susan Canavan[3], Maria Loreto Castillo[1], Sven Bacher[4], Ross Shackleton[5,6], Josef Brůna[7], Jan Čuda[1], Desika Moodley[1], Aníbal Pauchard Cortés[9,10], Jan Pergl[1], Klára Pyšková[1,2], Jonatan Rodríguez[8], Kateřina Štajerová[1], Petr Pyšek[1,2]

(1) Department of Invasion Ecology, Institute of Botany, Czech Academy of Sciences, Průhonice, Czech Republic.
(2) Department of Ecology, Faculty of Science, Charles University, Prague, Czech Republic.
(3) School of Natural Sciences, Ollscoil na Gaillimhe – University of Galway, Ireland.
(4) Ecology and Evolution, Department of Biology, University of Fribourg, Fribourg, Switzerland.
(5) Institute of Geography and Sustainability, University of Lausanne, Lausanne, Switzerland.
(6) Swiss Federal Institute for Forest, Snow and Landscape Research, Birmensdorf, Switzerland.
(7) Department of GIS and Remote Sensing, Institute of Botany, Czech Academy of Sciences, Průhonice, Czech Republic.
(8) CRETUS, Department of Functional Biology, Faculty of Biology, Universidade de Santiago de Compostela, Santiago de Compostela, Spain.
(9) Instituto de Ecología y Biodiversidad, Santiago, Chile.
(10) Laboratorio de Invasiones Biológicas, Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile.

Within the SynHab database (www.synhab.com), we gathered global information from more than 100 regions about which habitats are invaded by naturalized plant species, using local checklists and primary data from collaborators. This data will be used to analyse which ecological and human-related factors determine global patterns of habitat invasions. In this paper, we present a different perspective on habitat invasions. To answer the question of how the public perceives invasions in particular habitats and whether this perception reflects the severity of impacts caused by alien plants, we merged this data with the results of two other ongoing projects. First, the Global Survey of the Perception of Invasive Species project, based on inquiries of public opinion in 54 countries of the world spread across all continents, provided information on which habitats are perceived as most threatened by incursions of new taxa of animals and plants and which alien species present in their regions people are aware of. Additionally, within the SoNAF (Social dimensions of Naturalized Alien Flora) project, we pulled all tweets mentioning plant scientific or English common names using Twitter Academic API. From these, we will analyse sentiments and topics associated with species present in the SynHab database for which there is sufficient information (out of ~8000 taxa covered). The results of our study will provide insights into the role of socioeconomic determinants of plant invasions with a focus on the invaded habitat, which is an aspect that has not been explored so far.

Keywords: plant invasions, invasion culturomics, habitats

Financing: Grant Agency of the Czech Republic

Modelling the macroclimatic-niche potential of non-native plant species across the High-Arctic archipelago of Svalbard: Implications for management

James D. M. Speed[1], Luis R. Pertierra[2], Kristine B. Westergaard[1]

(1) Norwegian University of Science and Technology, Department of Natural History, NTNU University Museum, Trondheim, Norway
(2) University of Pretoria, Department of Plant and Soil Science, Hatfield, South Africa

Svalbard is an archipelago in the High Arctic, where tundra plant communities are generally species poor. While some non-native plant species have arrived, these are yet to spread; Svalbard has so far been spared the worst impacts of non-native plants. However, Arctic amplification of warming, and increasing human activity in this region increase the likelihood of establishment and range expansion of non-native plant species. In this study we use habitat suitability modelling to identify the regional bioclimatic niche potential of all 27 non-native vascular plant species listed for impact assessment on the non-native species register for Svalbard. We then project these niches across Svalbard under current climatic conditions and under future change scenarios. We find that the global climatic niche of some species such as *Deschampsia cespitosa* and *Saussurea alpina* predicts widespread potential presence across Svalbard. However, while Svalbard currently falls outside the realized niche of other species such as *Rumex acetosa* and *Trifolium repens*, these species may still find suitable climate under future climate change scenarios. Our results suggest that the remote eastern islands of the archipelago are climatically suitable for a higher number of non-native plant species than on the main island of Spitsbergen, where the only settlements are located. This highlights the importance of implementing preventative biosecurity measures against non-native plant species, particularly in the isolated regions of the archipelago with where the climate is suitable for many non-native species. Our study also deepens the understanding of establishment risk native for knowledge-based adaptive management of non-native species.

Keywords: Arctic, Climatic niche, Climate change

Building and implementing knowledge on biogeography, ecology and management of alien plants in high-Arctic Svalbard.

Kristine B. Westergaard[1]

(1) Norwegian University of Science and Technology, Department of Natural History, NTNU University Museum, 7491, Trondheim, Norway

Rising human activity in the Arctic combined with a warming climate increase the probability of introduction, establishment, and range expansion of alien plant species with profound implications for the ecosystems. Svalbard is a high-Arctic archipelago (74-81°N) with several permanent settlements where more than 100 alien plant species have been recorded through time. Their distribution is still limited to disturbed soils, predominantly on sites of imported soils, historical or current animal husbandry.

This talk will give an overview of the main results from several interdisciplinary projects targeting the biogeography, invasion ecology, impacts, and management of alien plants in Svalbard. Following a successfully implemented survey methodology for alien plants, we suggest an adaptive monitoring strategy anchored in existing regional, national, and pan-Arctic alien species strategies. We are building knowledge across all steps of the invasion chain from horizon scans for potential doorknocker species, identifications of source species pools, introduction pathways, early detection, monitoring, and management. We are also disentangling the processes that facilitate the establishment of alien plant species, and quantitatively assessing each species' ecological impact.

Svalbard presently has no biosecurity framework to limit unintentional introductions of alien plant species. In collaboration with environmental managements and the travel industry, we have developed an international information campaign to raise awareness of simple biosecurity measures among travelers to the Arctic. Through close cooperation with local managers, we are fulfilling the "science in action" principles, implementing new knowledge on alien plants into management tools and resources.

Keywords: High-Arctic aliens, adaptive monitoring, impact assessments

Posters

Legacy effect and potential for natural regeneration of plant communities after the control of a non-native tree in coastal dunes.

Mariana Adami Borgert[1], Mayara Krasinski Caddah[2], Michele de Sá Dechoum[3]

(1) Universidade Federal de Santa Catarina, Departamento de Ecologia e Zoologia, Centro de Ciências Biológicas, Trindade, Florianópolis, Brasil
(2) Universidade Federal de Santa Catarina, Departamento de Botânica, Centro de Ciências Biológicas, Trindade, Florianópolis, Brasil
(3) Universidade Federal de Santa Catarina, Departamento de Ecologia e Zoologia, Centro de Ciências Biológicas, Trindade, Florianópolis, Brasil

The control of non-native trees may not be sufficient for the regeneration of herbaceous and subshrubs native vegetation in restoration sites, given that the effects of the non-native plants may persist after their removal. These persistent effects are called legacy effects, which can influence the structure of plant communities as well as ecosystem functions and properties. This study aims to experimentally assess the legacy effect vialitter accumulation of non-native *Eucalyptus* on the regeneration of native vegetation in coastal vegetation in southern Brazil. All *Eucalyptus* trees were eliminated from the study area in September 2022. The experiment consists of two treatments: presence or physical removal of *Eucalyptus* litter. Ten plots (3x4m) of each treatment were randomly distributed in the study area, and ten plots were established in a control area. The cover, richness and composition of native species were initially assessed in all plots in November 2022. These preliminary results show that areas where *Eucalyptus* were present have lower vegetation cover and richness, and different species composition when compared to the reference area. New data collections will be conducted in April and October 2023. These new data will be used to assess the potential legacy effect of *Eucalyptus* on natural regeneration of the studied native vegetation, which may result in the necessity of additional interventions for the ecological restoration of coastal herbaceous subshrubs vegetation on sandy soils after the removal of non-native trees.

Keywords: Ecological restoration, Coastal ecosystems, Litter accumulation

The role of mammals in seed dispersal of fleshy-fruited invasive alien plants in the Grassland Biome of South Africa.

Lehlohonolo D. Adams[1,2], Sandy-Lynn Steenhuisen[3], Grant Martin[4,5], Colleen Downs[2]

(1) South African National Biodiversity Institute, National Botanical Gardens Free State, Bloemfontein, South Africa
(2) Centre for Functional Biodiversity, School of Life Sciences, University of KwaZulu-Natal, Pietermaritzburg, South Africa
(3) Afromontane Research Unit, Department of Plant Sciences, University of the Free State, Phuthaditjhaba, South Africa
(4) Afromontane Research Unit, Department of Zoology and Entomology, University of the Free State, Phuthaditjhaba, South Africa
(5) Centre for Biological Control, Department of Zoology and Entomology, Rhodes University, Makhanda, South Africa

Fleshy-fruited invasive alien shrubs are an increasing problem in the grasslands of South Africa, where they impact vegetation structure and reduce biodiversity. These species are predominantly bird-dispersed in forest systems, but their spread in grassland ecosystems remains understudied, including their dispersal by mammals. Mammals facilitate seed movement and may also promote seed germination and seedling establishment. This study aimed to determine the role of mammals in the seed dispersal of fleshy-fruited invasive alien plants in selected grasslands. The dung of eland (Taurotragus oryx), chacma baboon (Papio ursinus), domestic goat (Capra hircus), and black-backed jackal (Lupulella mesomelas) was collected in the grasslands of the eastern Free State during 2022. Seeds were removed from the dung, identified to species level, and planted in a greenhouse setup. Seeds of the invasive species Cotoneaster pannosus, Pyracantha angustifolia and Rosa rubiginosa (all Rosaceae) were identified from the dung. Germination experiments showed no differences in germination between ingested P. angustifolia seed and manually de-pulped controls, while there were significant differences in C. pannosus seed germination compared with manually de-pulped controls. The ingested seeds had higher germination success than the de-pulped seeds in C. pannosus. Overall germination of R. rubiginosa seeds from faeces was very low (<2%), similar to controls. Mammals were shown to be significant dispersers of invasive fleshy fruiting plants in the grasslands of eastern South Africa, but the effects of ingestion on germination differed between plant species.

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Control of invasive plants in Galapagos: costs and challenges.

Miriam San Jose Alcalde[1], Ricardo Mancero[2], Christian Sevilla[3], Rafael Chango[3], Heinke Jäger[1]

(1) Charles Darwin Foundation, Charles Darwin Research Station, Av. Charles Darwin s/n, Puerto Ayora, Santa Cruz, Ecuador
(2) Pontifical Catholic University of Ecuador, Economics School, Av. 12 de octubre 1076, Quito, Ecuador
(3) Galapagos National Park Directorate, Av. Charles Darwin s/n, Puerto Ayora, Santa Cruz, Ecuador

Invasive plant species are a major threat to native island biodiversity in Galapagos. They render havoc on the native ecosystems by displacing endemic plant species, and thus threatening the associated faunal community. The Galapagos National Park Directorate (GNPD) initiated the control of invasive plants in ecologically and economically important sites more than 50 years ago, such as nesting areas of endangered endemic birds and popular tourist destinations. Attempts had been made in the past to estimate the costs of these control actions, but they were approximations and calculated values had a high degree of uncertainty. Our research gathered information from daily reports of plant control actions at five sites conducted by GNPD rangers from January 2015 to April 2019 on Santa Cruz Island, Galapagos. The costs of personnel and materials were obtained for each year, as well as for the entire period. Over this 5-year period, the GNPD spent more than $1.32 million on the control of ten invasive plants in five conservation priority areas within the National Park. Personnel costs accounted for the major expense ($1.28 million), followed by equipment and materials ($46.6k). In other words, the GNPD has to spend between $282.7k and $354.5k on personnel and on average $9.6k on equipment per year. However, due to the extensive distribution of invasive plants on Santa Cruz, their control is an uphill battle that gets more expensive every year. Therefore, cost-effective long-term control strategies for the worst invaders, like blackberry (*Rubus niveus*), are currently being developed.

Keywords: economic, islands, protected areas

Financing: Lindblad Expeditions - National Geographic Fund

The Role of Trails in the Redistribution of Non-native Plants in Mountain Ecosystems of Central-Southern Chile.

Tomas Arellano Contardo[1,2], Aníbal Pauchard Cortés[1,2], Eduardo Fuentes-Lillo[1,2], Rafael Andres García Araya[1,2]

(1) Laboratorio de Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile
(2) Instituto de Ecología y Biodiversidad (IEB), Santiago, Chile

High-altitude ecosystems are historically ecosystems that have been free from the presence of non-native plants, mainly due to extreme climatic conditions and low levels of anthropogenic disturbances. However, mountain activities and the presence of trails have allowed some non-native plants from lowlands to distribute to highlands. The objective of this study is to analyze the role of trails in the redistribution of non-native plants in three protected areas in central-southern Chile. To analyze these patterns, we selected three trails in Laguna Laja National Park, Ralco National Reserve, and Conguillio National Park, and applied the MIREN-trail protocol. In each trail, we installed 10 plots composed of 3 subplots of 2x10 m2, 1 parallel to the trail and 2 perpendiculars to the trail, where we quantified the richness and abundance of non-native and native plants. Preliminary results indicated that richness and abundance decreased with elevation. Additionally, we determined that non-native plant richness decreases in interior plots (perpendicular to the trail). When analyzing the importance of variables, we determined that non-native plant richness is mainly influenced by the presence of the trail, while native plant coverage and elevation are the main factors contributing to the decrease in non-native plant richness. These preliminary results highlight the role of trails in explaining the richness and abundance of non-native plants, however more studies are needed to analyze other disturbance agents such as the presence of livestock and microclimatic variables.

Keywords: Protected areas, Miren-trail, Anthropogenic disturbances

Financing: Fondecyt 1180205, Fondecyt 1231616 and ANID/BASAL FB210006

Small area, big problems? Invasion assessment of exotic plant species in an urban-surrounded protected area of south-central Chile.

Paola Arroyo-Vargas[1,2], Jonathan Urrutia[3], Aníbal Pauchard[3], Andrés Fuentes-Ramírez[2,4]

(1) Portland State University, Department of Geography, Portland OR, United States
(2) Universidad de La Frontera, Facultad de Ciencias Agropecuarias y Medioambiente, Laboratorio de Ecosistemas y Bosques, Temuco, Chile
(3) Universidad de Concepción, Facultad de Ciencias Forestales, Laboratorio de Invasiones Biológicas, Concepción, Chile
(4) Pontificia Universidad Católica de Chile, Centro Nacional para la Industria de la Madera (CENAMAD), Santiago, Chile

Biodiversity within protected areas is threatened due to the increasing number of exotic and invasive plant species. Although these ecosystems have been perceived as a resistant community to invasion, several exotic species have been reported establishing in the understory of these forests. The Monumento Natural Cerro Ñielol (MNCÑ) is a small protected area (89.5 ha) that conserves one of the last remnant native forests that originally covered the valley area of south-central Chile. The MNCÑ is one of the most visited protected areas in La Araucanía region, which is surrounded by an urban-silvicultural matrix. To evaluate the increasing effect of plant invasion within the MNCÑ, we established 15 T-shape plots stratified in three subplots (roadside, intermediate, interior; N=45) along the main roads to understand this effect across a distance gradient. We identified and estimated the abundance of all vascular plant species, also assessing light availability in the understory. We found a total of 106 species growing in the understory, of which 47% were non-native species. These plants were significantly concentrated along roadsides, decreasing to the interior subplots. However, some exotic species were able to colonize areas where the light availability was lower (e.g., *Hedera helix, Viburnum tinus*), which could directly compete with native species. Our findings show the high anthropization of the MNCÑ, which is enhanced by the roads and trails that cross the forest. Early detection, control, and eradication of exotic species through management plans is needed to conserve this protected area within a high-pressure urban-silvicultural matrix.

Keywords: exotic plant species, urban protected areas, exotic species assessment

Cascading colonization and the invasion process in a linear infrastructure development in Brazil.

Matheus S. Asth[1], Renato Garcia Rodrigues[1]

(1)Universidade Federal do Vale do São Francisco, Center of Ecology and Environmental Monitoring

The Ramal do Agreste (RAG) is a 70 km long secondary canal of the São Francisco River Integration Project (PISF), an interbasin water transfer, in Northeast Brazil. This branch was constructed from a canal of PISF, which served as an initial pool of invasive alien species (IAS) propagules. Ten monitoring surveys were conducted at RAG from the beginning of the canal construction (June/2018) to now (January/2023), in 14 permanent sampling points (PSP) (5 km apart) covering the entire development. Richness of IAS was collected at each sampling point. The colonization of IAS began at the first four points near the PISF. Two years after the first survey, the eight first points presented the greatest numbers of IAS accumulated richness. In 2023, four and a half years after construction began, 12 PSP exhibited similar numbers of accumulated IAS richness. The invasion process seems to follow a similar pattern to the onefound for PISF. The interventions imposed by the development favor the initial establishment of IAS by making previously unavailable habitats available. However, the constant movement of the soil during the installation of the development (for use as building material) acts as a management agent for IAS populations, acting as a temporary barrier to the expansion of these species. During the operation of the development, the level of intervention in the environment was drastically reduced. This fact, combined with the absence of programmatic management, increased both the occurrence of already established species and the introduction of new alien species.

Keywords: plant invasion, invasion pathway, environmental monitoring

Monitoring of biological invasions in linear infrastructure projects: methods for a rapid field assessment.

Matheus Asth[1], Renato Rodrigues[1]

(1) Universidade Federal do Vale do São Francisco, Center of Ecology and Environmental Monitoring, Biological Sciences, Rodovia BR 407, Lote 543 - Projeto de Irrigação Nilo Coelho, S/N, Petrolina, Brazil

Infrastructure megaprojects are usually related to the spread of invasive alien species (IAS). Monitoring the process of biological invasions in these projects can be difficult due to their magnitude. Here, we present two tested methods for rapid monitoring of IAS colonization and dispersal in linear developments. The methods are divided into types of data to be collected: (i) Data on species richness and frequency of occurrence are collected from permanent sampling points (PSP) covering the entire development. The amount and distance between PSP depend on the size of the area of interest. (ii) Invasion status and colonization dynamics are assessed by estimating the number of reproductively active individuals and measuring the length of populations. Data are collected driving at limited speed (max. 20 km/h) along the entire length of the development. With a portable GPS, the geographic coordinates where each population begins and ends are recorded, and the number of plants producing flowers and/or fruits is counted. Populations are classified as sterile, casual, naturalized or invasive. Both methods can be conducted one or more times a year, depending on the climatic conditions of the area. The temporal and spatial data produced can be used to compare IAS colonization dynamics over the years. These two methods have been used since 2015 to monitor IAS at the São Francisco River Integration Project, an interbasin water transfer, in Northeast Brazil. The average time it takes to monitor 85 sampling points and more than 470 km of length is 15 days.

Keywords: invasive species, plant invasion, environmental monitoring

Financing: Ministry of Integration and Regional Development, Brazilian Government

Inference for epidemic models with time-varying Infection rates: Tracking the dynamics of oak processionary moth in the UK.

Andrew Baggaley[1]

(1) Newcastle University, School of Mathematics & Statistics, Science, Agriculture & Engineering, Herschel Building, Newcastle Upon Tyne, United Kingdom

1. Invasive pests pose a great threat to forest, woodland and urban tree ecosystems. The oak processionary moth (OPM) is a destructive pest of oak trees, first reported in the UK in 2006. Despite great efforts to contain the outbreak within the original infested area of South-East England, OPM continues to spread.

2. Here we analyse data consisting of the numbers of OPM nests removed each year from two parks in London between 2013 and 2020. Using a state-of-the-art Bayesian inference scheme we estimate the parameters for a stochastic compartmental SIR (susceptible, infested, removed) model with a time-varying infestation rate to describe the spread of OPM.

3. We find that the infestation rate and subsequent basic reproduction number have remained constant since 2013 (with R_0 between one and two). This shows further controls must be taken to reduce R_0 below one and stop the advance of OPM into other areas of England.

4. Our findings demonstrate the applicability of the SIR model to describing OPM spread and show that further controls are needed to reduce the infestation rate. The proposed statistical methodology is a powerful tool to explore the nature of a time-varying infestation rate, applicable to other partially observed time series epidemic data.

Keywords: Invasive Pests, SIR model, Oak Processionary Moth

Stakeholders network for the management of invasive species Pinus contorta in Araucaria araucana forest in Chile.

Sergio Andres Benavides Avendaño[1,2,3], Aníbal Pauchard Cortés[3,4], J. Cristóbal Pizarro[1,4], Walter Galdamez Opazo[1]

(1) Laboratorio de Estudios del Antropoceno (LEA), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile
(2) Naturaleza Intrusa (NI), Concepción, Chile
(3) Laboratorio Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile
(4) Instituto de Ecología y Biodiversidad (IEB), Santiago, Chile

To carry out an effective management of invasive species, it is necessary to establish work networks through which information circulates, generate support and resources for the joint work of a group of social actors. This research analyzed the network o factors linked to forest conservation in the Malalcahuello National Reserve, evaluating the communication patterns and structures regarding the problem of Pinus contorta invasion. Through semi-structured surveys of 36 people associated with that area, the level of knowledge and perception about the state of invasion and the willingness to collaborate with Pinus contorta control strategies was measured. The relationship between actors was characterized through network analysis and the influence of network structure on the knowledge, perception and willingness to collaborate of each actor. Results show that this network is made up of six groups or communities, with a low links density, where hierarchical interactions predominate. Despite the foregoing, most of the actors have a high level of knowledge about the problem and declare that they are willing to collaborate with its control. Although the structure of the network of actors has been effective in disseminating information, the majority of respondents are dissatisfied with the current management of the invasion. To advance in solving this problem, is necessary to strengthen the network of actors, mobilize resources to support the execution of participatory management strategies, which allow to take advantage of the potential of the network.

Keywords: Public Protected areas, co-management, network analysis

Financing: Fondecyt 1180205, Fondecyt 1231616, ANID/BASAL FB210006

Landscape Drivers of Plant Invasion – Impacts and Implications for Landscape Management.

Kateřina Berchová Bímová[1], Johana Jackovičová[1], Martina Kadlecová[1], Josef Kutlvašr[1,2], David Petrus[1,3], Martin Vojík[1,3]

(1) Czech University of Life Sciences Prague, Department of Applied Ecology, Faculty of Environmental Sciences, Kamýcká 129, Prague 6, Czech Republic
(2) Institute of Botany, Czech Academy of Sciences, Department of Biological Invasions, Zámek 1, Průhonice, Czech Republic
(3) Nature Conservation Agency of the Czech Republic, Kaplanova 1931/1, Prague, Czech Republic

Invasive plant species have significant impacts on ecosystems. Understanding the landscape factors that drive biological invasions is essential for developing effective strategies to prevent, manage, and mitigate their impacts. This study utilized a three-level landscape approach and a two-time horizon comparison to investigate the spatiotemporal patterns of invasive species in the Czech Republic. Recent field mapping covered twelve sample squares representing different regions and landscapes, with data on invasive species presence, habitat types, anthropogenic influence and dispersal vectors. Ecosystem and landscape characteristics as predictors were obtained from various GIS sources.

At the regional level, the study found that the spatial distribution of specific invasive species depends on their source of spreading and local management in addition to ecological conditions, land use, and climatic constraints. At the landscape level, the influence of dispersal vectors and various anthropogenic activities on the spread of invasive species was analyzed, with interesting findings such as the impact of power lines and forest logging on the spread of certain invasive species. The study also found that the invasiveness of protected areas was influenced by anthropogenic pressure in the form of tourism and management of the surrounding landscape.

The study results are based on field mapping and provide additional insight into the invasiveness of the landscape in the Czech Republic. We compared our results with trends in plant invasions based on database data. Detailed data on invasive species' presence also allow targeted nature protection management.

Keywords: field mapping, spatiotemporal pattern, management strategies

Spatial distribution at a farm level of *Ulex europaeus* L. in the Eastern region of Uruguay.

Alejandra Borges[1], Carolina Munka[2], María Fernanda De Santiago[2], Rodrigo Olano[2], Lucía Pérez[2], Daniella Bresciano[2]

(1) Universidad de la República, Biometría, Estadística y Computación, Facultad de Agronomía, Garzón 780, Montevideo, Uruguay
(2) Universidad de la República, Departamento de Sistemas Ambientales, Facultad de Agronomía, Garzón 780, Montevideo, Uruguay

Ulex europaeus L. (gorse) is one of the invasive species prioritized for control in Uruguay. The spatial distribution of this species is determined not only by its physiological and ecological characteristics (invasiveness), but also by the land use history and the vegetation mosaic (invasibility). Understanding its spatial distribution at a farm level is essential for planning efficient management programs. For this purpose, a 30 ha area was selected that included both slopes of a hill all the way down to the lowlands, in the department of Lavalleja. The area had a minimum altitude of 207 meters above sea level and a maximum of 304 meters. We identified 202 patches or individual plants that showed great variability in their dimensions, such as in the perimeter of the patches (CV=96%) and somewhat less in height (CV=30%). In relation to spatial distribution, it was found that from short distances (less than 10m) the spatial pattern of gorse patches is not random but aggregated. The intensity of occurrence of patches, defined as the expected number of events per unit area, was estimated from the data. It was found that the intensity is not constant throughout the study area, being much higher on the east-facing slope and mainly in areas of lower altitude (near the base of the hill), reaching values of 3500 plants per km2, while on the west slope the intensity values did not exceed 500 plants per km2.

Keywords: gorse, invasion, dispersion

Financing: Comisión Sectorial de Investigación Científica – Udelar

Scents of Australia in the Mediterranean: results of the first survey on the total number of introduced Eucalyptus species.

Giuseppe Brundu[1,2], Necmi Aksoy[3], Mohamed Abdelaziz Balah[4], Ioannis Bazos[5], Antonio Brunori[6], Jean-Marc Dufour-Dror[7], Guillaume Fried[8], Vanessa Lozano[1,2], Stephen Mifsud[9], Ana Novoa[10], Joaquim S. Silva[11,12], Najla Sayari[13], Nataša Šibanc[14], Marjana Westergren[14], Ahmet Uludağ[15], David M Richardson[10,16]

(1) Department of Agricultural Sciences, University of Sassari, Italy
(2) National Biodiversity Future Center (NBFC), Palermo, Italy
(3) Faculty of Forestry, Department of Forest Botany and DUOF Herbarium, Düzce University, Türkiye
(4) Plant Protection Department, Desert Research Center, Cairo, Egypt
(5) Department of Biology, National and Kapodistrian University of Athens, Greece
(6) PEFC Italy, Via Cestellini 17, 06135 Perugia, Italy
(7) Independent Ecologist, Consultant, Shachar st. 1, Jerusalem 9626301, Israel
(8) Plant Health Laboratory, Anses, France
(9) EcoGozo Directorate, Ministry for Gozo, Victoria, Gozo, Malta
(10) Department of Invasion Ecology, Institute of Botany of the Czech Academy of Sciences, CZ-252 43, Průhonice, Czech Republic
(11) College of Agriculture, Polytechnic of Coimbra, Portugal
(12) Centre for Functional Ecology, University of Coimbra, Portugal
(13) Higher Agronomic Institute of Chott Mariem, University of Sousse, Tunisia
(14) Slovenian Forestry Institute, Slovenia
(15) Plant Protection Department, Faculty of Agriculture, Canakkale Onsekiz Mart University, Türkiye
(16) Centre for Invasion Biology, Department of Botany and Zoology, Stellenbosch University, South Africa

The present research project started in 2020 aiming to draw the first and most comprehensive analysis of the distribution and total number of introduced *Eucalyptus* s.l. species, including hybrids, in the countries of the Mediterranean basin. The inventory was based on all available information from the scientific and grey literature, *Index Semina*, horticultural and arboreta catalogues, herbarium data, field surveys, and from any other available and reliable source, including documents and reports published in local languages and our own experiences in the field.

We have found that approximately 300 non-native *Eucalyptus* s.l. species have been introduced since the late 19th century. A rather complex picture is emerging from the preliminary results of this study. We have found that the introduced *Eucalyptus* s.l. species in the circum-Mediterranean region, are in very different stages along the introduction-naturalization-invasion continuum, i.e., from species that failed to establish in the wild, to highly invasive taxa. However, while the invasion status of few introduced species is very well documented, very limited information is available for most of the other introduced *Eucalyptus* s.l. species. Also, the motivations for introduction and the regions or land-use types where introduced have slightly changed over time, reflecting cultural and social changes, modifications in forestry policies, and other historical aspects. The detailed database compiled in this study will provide a valuable and updated source of information for further investigations on the ecology of introduced *Eucalyptus* species, and for the elaboration of future weed risk assessments in the Mediterranean regions.

Keywords: Non-native trees, plantation forest, introduction pathways

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Invasive plants in Bosque Pehuén, biological legacies of past logging activities in a private conservation area.

Sebastian Carrasco[1], Amerindia Jaramillo[1]

(1) Fundación Mar Adentro, Conservation, Pedro de Valdivia 205, Pucón, Chile

Invasive plants are one of the most recognizable threats to the biodiversity conservation and ecological processes in the forests of southern South America. Bosque Pehuén is a natural laboratory for conservation and multidisciplinary research, where we explore strategies to protect the biodiversity of the temperate rainforests of southern Chile, with the aim of protecting ecosystems that have high territorial pressure, high ecosystem values such as the araucaria forests and the headwaters of Palguin watershed and which are highly vulnerable to drivers of environmental changes. Bosque Pehuén covers 882 hectares of this forest types, an area that concentrates the greatest biodiversity and endemism in Chile, which, in turn, has been one of the most transformed areas. In order to deepen the knowledge about the invasive plants present in the area and make management decisions based on scientific evidence, we analyzed the composition and richness of invasive plant species in Bosque Pehuén. We found more than 20 invasive species, with a greater relative abundance in areas dominated by past interventions within the forest, where the presence of *Pseudotsuga menziesii* stands out in *Araucaria* and *Nothofagus* forests above 1,000 m asl, shrubs such as *Rosa rubiginosa* and *Rubus constrictus*; and herbaceous plants such as *Lotus pedunculatus, Digitalis purpurea* and *Achillea millefolium* in areas devoid of tree vegetation. Our findings will allow making management decisions for the conservation and the design of socio-ecological restoration initiatives in the Andes mountains of La Araucanía region.

Keywords: biological legacies, invasive plants, private conservation lands

Financing: Fundación Mar Adentro

Invasive non-native species in federal protected areas in Brazil: an assessment based on management plans.

Ana Luiza Castelo Branco Figueiredo[1,2], Carlos Eduardo de Siqueira[3], Michele de Sa Dechoum[4]

(1) Universidade Federal de Santa Catarina, Departamento de Ecologia e Zoologia, Programa de Pós Graduação em Ecologia, R. Eng. Agronômico Andrei Cristian Ferreira, s/n - Trindade, Florianópolis - SC, Brasil
(2) Institudo Chico Mendes de Conservação da Biodiversidade, Parque Nacional de São Joaquim, Rua Pedro Bernardo Warmling 1542, Urubici - SC, Brasil
(3) Instituto de Meio Ambiente de Santa Catarina, Gerência de Licenciamento Ambiental e Autorizações de Obras Públicas, Av. Mauro Ramos, 428 - Centro, Florianópolis - SC, Brasil
(4) Universidade Federal de Santa Catarina, Departamento de Ecologia e Zoologia, Programa de Pós Graduação em Ecologia, R. Eng. Agronômico Andrei Cristian Ferreira, s/n - Trindade, Florianopolis - SC, Brasil

Although the creation and implementation of protected areas (PAs) is the main strategy for biodiversity conservation worldwide, the number of invasive non-native species (INNS) and the costs associated with their management in PA have been increasing over the last decades. The implementation of projects focused on the management of INNS must be central to reach the objectives of these PAs. In Brazil, each PA must have a management plan (MP), in which the goals and specific regulations used for the management of the PA are established. Currently, 219 out of the 334 federal PA have official MP. Our main aim is to describe patterns of occurrence of INNS in PA in Brazil and to investigate factors that may explain their presence based on the information available in the MP. A search using the keywords ¨invasão(ões) biológica(s)", "espécie(s) invasora(s)", "espécie(s) exotica(s)", "alóctone(s)", "não autóctone(s)", "não nativa(s)" was conducted for all MP using R algorithms from shell linux and R languages. To date, 198 out of the 219 MP mentioned one or more of the keywords searched. All MP will be checked to verify how many and which INNS occur in each PA. Generalized linear models will be used to assess which factors explain the number of INNS (response variable) using year of publication of the MP, biome in which the PA is located, PA area, and PA category as fixed effects. We expect that our results could be used to provide guidance for planning management policies for PAs in Brazil.

Keywords: Invasive Species; Protected Areas; Management Plan

Invasive spread of alien *Spartina densiflora* upstream with sea level rise in an acidic, metal-polluted estuary.

Jesús M. Castillo[1], Brenda J. Grewell[2], Felipe J. Parra-Perea[1], José Jimenez-Higuera[1], Blanca Gallego-Tévar[1]

(1) Universidad de Sevilla, Departamento de Biología Vegetal y Ecología, Biología, Ap. 1095, 41080, Sevilla, Spain
(2) University of California, Department of Plant Sciences MS-4, USDA-ARS Invasive Species and Pollinator Health Research Unit, Davis, United States of America

Climate change, pollution and biological invasions are major environmental components configuring the current global environmental crisis. Sea level rise (SLR) is moving tidewater further upstream into estuaries, yet little is known about the spread of alien plants into upstream reaches with historic chemical pollution. Our study model is the changing invasion front of alien *Spartina densiflora* upstream along the metal-polluted Tinto Estuary. We recorded location, elevation and tussock diameter of recently established *S. densiflora* tussocks (n = 94) colonizing 4251 m along the Tinto River. The age of each tussock was estimated based its lateral expansion rate. We characterized the sedimentary environment in 2003, 2007 and 2023. Sediment pH and conductivity in winter increased 29% and 50% from 2003 to 2023, respectively. The invasion rate of *S. densiflora* upstream along the Tinto River has been 129 ± 3 m yr-1 during the last 26 yr. Preliminary results show that the expansion of *S. densiflora* with SLR exacerbates the degradation of marshes, adding biopollution to historic chemical pollution.

Keywords: climate change, invasion rate, tidal marshes

The Biology of Invasive Plants Series Provides Critical Information on Global Invasion Pathways and Risks.

David Clements[1], Darren Kriticos[2], Antonio DiTommaso[3]

(1) Trinity Western University, Biology, Faculty of Natural and Applied Sciences, 22500 University Drive, Langley, BC, Canada
(2) CSIRO, GPO BOX 1700, Canberra, Australia
(3) Cornell University, School of Integrative Plant Science Soil and Crop Sciences Section, College of Agriculture and Life Sciences, Ithaca, NY, United States

In 2020, *Invasive Plant Science and Management* launched a new series entitled "Biology of Invasive Plants." The BOIP series is designed to provide comprehensive global reviews of the biology and management of invasive plants, including extensive details on global distribution and invasion pathways. The series is unique from series such as the Biology of Australian Weeds, Biology of Canadian Weeds, and Biology of Invasive Alien Plants in Canada in that it is worldwide in scope and aimed at highlighting potential invasion pathways. Authors wishing to contribute an account should consult the series editors, David Clements and Darren Kriticos, as to whether the species (or groups of closely related species) is suitable for the series, has not already been reserved, and should assemble an international team of authors. The BOIP reviews are comprised of the following sections: Name and Taxonomy, Importance, Description, Distribution, Habitat, Invasion History, Life-Form and Life History, Dispersal and Establishment, Invasion Risk, Invasion Pathways, Growth and Development (including subsections), Reproduction (including subsections), Population Dynamics, Management Options (including subsections), and General Outlook. There is also an "At a Glance" feature highlighting important aspects of the review. Accounts have been published on *Pyracantha angustifolia, Lycium ferocissimum*, and *Vincetoxum* spp. with accounts for several more species/taxa in preparation for potential publication. Given the global reach of many invasive plant species, the BOIP series aims to provide a comprehensive source of information on the biology and global risk of invasion of plant species which are established or emerging threats to biosecurity.

Keywords: invasion pathways, global distribution, invasive plant biology

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How the control of Carpobrotus acinaciformis can affect bee pollination networks?

Luiz Felipe Cordeiro Serigheli[1], Sofia Grabriele Marafon Bacca[2], **Michele de Sá Dechoum**[1]

(1) UFSC, CCB/ECZ, Programa de pós-graduação em Ecologia, Florianópolis, Brasil
(2) UFSC, CCB/ECZ, Graduação em Ciências Biológicas, Florianópolis, Brasil
*Corresponding author: luiz_serigheli@hotmail.com

Invasive non-native plants can cause changes in ecological networks. *Carpobrotus acinaciformis* (Aizoaceae) is native to South Africa and invasive on coastal dunes in several regions, including the southern coast of Brazil. This study aims to assess the effects of the invasion as well as of the management of *C. acinaciformis* on bee pollination networks. Between October 2021 and January 2022, active search and collection of bees visiting native plants was conducted in two different areas: one invaded by *C. acinaciformis* and the other not. The invader was controlled in July 2022. The same data collection method was used from October 2022 to January 2023. Abundance matrices (plants x bees) were built for comparison of nestedness, connectance and modularity among the three networks (invaded, non-invaded and managed). Null models were generated to check if the results found were not random. 1345 bees of 29 morphotypes were sampled; 30 plant species were visited. The invaded network was composed of 538 bees, 21 morphotypes and 21 plant species; the non-invaded network of 383 bees, 19 morphotypes and 26 plant species; and the managed network had 424 bees, 21 morphotypes and 17 plant species. The invasive bee *Apis mellifera* was the most abundant species in the invaded and in the managed areas, and the second in the non-invaded area. The network invaded by *C. acinaciformis* is more nested and shows less connectance and modularity when compared to the non-invaded and to the managed networks, highlighting the changes the invader may cause in pollination networks.

Keywords: invasive species, ecological network, coastal ecosystems.

Anthropogenic habitats drive functional traits and herbivory in Neotropical spontaneous urban flora.

Wanda Karolina da Silva[1], Rafael Dudeque Zenni[1]

(1) Universidade Federal de Lavras, Departamento de Ecologia e Conservação, Programa de Pós-Graduação em Ecologia Aplicada, CEP 37200-900, Lavras, Brazil

Urbanization is among the main drivers of global and biodiversity changes. However, there needs to be more evidence of how urban gradients drive plant traits and interactions with herbivores in Neotropical regions. Here, we investigated how urbanization intensity and anthropogenic habitats affected species richness, cover, composition, functional traits (height, specific leaf area (SLA), life form, and dispersal syndrome), and herbivory in native and non-native plants that establish spontaneously in cities. We sampled plants on sidewalks and vacant lot habitats along a paving gradient in the urban perimeter of a medium Neotropical city in Brazil. We collected 88 species in total, 38 natives and 50 non-natives. Non-native species corresponded to 64.6% of the occurrences. Habitat type had a stronger influence on plant communities than urbanization intensity. Species richness decreased with the increasing paving area, vegetation cover was higher in vacant lots, and species compositions differed between sidewalks and lots. The non-native community was more restricted to sidewalks. For functional traits, non-native communities' height was higher in lots, and SLA increased with the percentage of paving area. Therophyte life form was more frequent on sidewalks, whereas non-native geophytes, all chamaephytes, and native hemicryptophytes were in lots. Regarding dispersion syndromes, native autochorics were more frequent on sidewalks and all zoochorics in lots. Our study in a medium-sized Neotropical city found that vacant lots had a greater range of community traits and more evidence of herbivory than sidewalks. This highlights the importance of vacant lots for supporting plant biodiversity within urban gradients.

Keywords: Anthropogenic habitats, Functional Traits, Neotropical urban flora

Decreased functional dispersal traits of spontaneous plants in urban areas.

Jonathan de Almeida[1], Gustavo Heringer[1], Rafael Dudeque Zenni[1]

(1) Universidade Federal de Lavras, Departamento de Ecologia e Conservação, Instituto de Ciências Naturais, CEP 37200-900, Lavras, Minas Gerais, Brazil

Urbanization is a significant form of landscape alteration characterized by the proliferation of impervious structures. For urban vegetation, dispersal plays a crucial role in enabling plants to colonize spaces that provide favorable conditions for germination. In this study, we investigated how the increase in the intensity of urbanization affects the dispersive functional characteristics of a spontaneous plant community. We examined the effect of urbanization intensity on the variation in height, quantity, size, and weight of fruits and seeds of plants from the herbaceous and shrub strata with different invasion status (i.e., native, naturalized, and invasive) in Lavras-MG, Brazil. The data were analyzed using generalized linear mixed-effect models. We identified a total of 88 plant species, including 43 native species, 24 naturalized species, and 21 invasive species. The three most frequent species were *Euphorbia hirta* (49% of 120 plots), *Eleusine indica* (45.8%), and *Eragrostis pilosa* (29.2%), all of which were invasive. The number of fruits and size of seeds of native species decreased with increasing urbanization. The height of exotic (invasive and naturalized) and invasive exotic species also decreased along the urbanization gradient, as well as the number of seeds of the naturalized species. Urbanization affects different dispersal traits in species with different invasive statuses. In general, the tendency of smaller dispersive structures illustrates the filtering of functional traits caused by urbanization. The effect of urbanization intensity on the number of native fruits may alert to the limitation of these species colonizing urban areas.

Keywords: Exotic species, Dispersal functional traits, Urbanization

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Establishment of *Sporobolus cryptandrus* (Torr.) A. Grey (Poaceae) - a new invasive species in Hungary.

Patricia Elizabeth Diaz Cando[2], Péter Török[1,2,3], D. Schmidt[4], A. Kelemen[3,6,7], Z. Bátori[5], E. Aradi[6], A. Hábenczyus[5], C. Tölgyesi[1], R.W. Pál[8], N. Balogh[1], E. Tóth[1,2], G. Matus[9], J. Táborská[10], G. Sramkó[9], L. Laczkó[9,11], S. Jordán[9,11], A. McIntosh-Buday[1,2], G. Kovacsics-Vári[2], Judit Sonkoly[1,2]

(1) MTA-DE Lendület Functional and Restoration Ecology Research Group, 1 Egyetem sqr.,, 4032 Debrecen,, Hungary
(2) University of Debrecen, Department of Ecology, 1 Egyetem sqr, 4032 Debrecen, Hungary
(3) Polish Academy of Sciences, Botanical Garden - Center for Biological Diversity Conservation in Powsin,, Prawdziwka St., 202–973, Warszawa, Poland
(4) University of Sopron, Institute of Botany and Nature Conservation, 4 Bajcsy-Zs. str., 9700 Sopron, Hungary
(5) University of Szeged, Department of Ecology, 52 Közép boulevard, 6726 Szeged, Hungary
(6) Kiskunság National Park Directorate, 19 Liszt Ferenc str., 6000 Kecskemét, Hungary
(7) Lendület Seed Ecology Research Group, Institute of Ecology and Botany, Centre for Ecological Research, 2–4 Alkotmány Street,, 2163 Vácrátót, Hungary
(8) Montana Technological University, Department of Biological Sciences, 1300 W Park Street, Butte, MT 59701, USA
(9) University of Debrecen, Department of Botany, 1 Egyetem sqr., 4032 Debrecen, Hungary
(10) Eszterházy Károly University, Department of Botany and Plant Physiology, 6 Leányka str., 3300 Eger, Hungary
(11) MTA-DE "Lendület" Evolutionary Phylogenomics Research Group, 1 Egyetem sqr., 4032 Debrecen, Hungary

The study focuses on the invasion of Sporobolus cryptandrus, a North American grass species, in Eurasian sand areas. We conducted field surveys in Central and Eastern Hungary to determine the distribution, habitat preferences, seed bank formation, germination traits, and effects on vegetation composition of the invasive species. The surveys revealed significant stands of Sporobolus cryptandrus in the Kiskunság region, Hungary, where it negatively affects plant species richness and abundance. The study also identified the formation of a persistent seed bank by the invasive species, with viable seeds found in different soil layers. We emphasize the need to determine the origin of the populations, assess its competitive ability, evaluate seed bank formation under diverse conditions, and explore management techniques for control. Understanding the invasion dynamics and ecological impacts of Sporobolus cryptandrus is crucial for developing targeted management strategies and protecting the biodiversity and ecosystem functions of affected regions in Eurasian sand areas.

Keywords: Invasion, seedbank, germination

Hydrogeomorphological processes of rivers and plant invasions. What interactions in the case of Asian knotweeds?

Marie Didier[1], Laurent Borgniet[1], Caroline Le Bouteiller[2], André Evette[1], Mireille Boyer[3], Fanny Dommanget[1]

(1) U. Grenoble Alpes, LESSEM, INRAE, 2 rue de la papeterie, F-38400 St-Martin d'Hères, France
(2) U. Grenoble Alpes, IGE, INRAE, 2 rue de la papeterie, F-38400 St-Martin d'Hères, France
(3) Concept Cours d'eau SCOP Aquabio, 108 Avenue du Leman, 73372 Le Bourget du Lac, France

Considered one of the five major threats to biodiversity worldwide, Invasive Alien Species (IAPS) particularly threaten riparian ecosystems. Among the IAPS found on riverbanks, Asian knotweeds (*Reynoutria* spp. including *R. japonica* Houtt. ; *R. sachalinensis* (F.Schmidt) Nakai and the hybrid *R. x bohemica* Chrtek & Chrtkova) can barely be controlled as, once established, they disperse easily along stream banks *via* rhizome or stem fragments transported by water. However, the hydrogeomorphological processes underlying the establishment of Asian knotweeds are poorly understood. The objective of this study was to describe and model the hydrogeomorphological preferences of Asian knotweeds along a Mediterranean river. Based on exhaustive presence/absence surveys, we implemented two models related to the presence of Asian knotweeds: (1) at the river reach scale and (2) at the finer scale of the alluvial bar. Areas of low curvature identified as convex banks and the central parts of alluvial bars appear to be more susceptible to knotweed establishment. Highly disturbed areas were less favorable to maintaining plant species, including Asian knotweeds, while less disturbed areas with denser plant cover were more favorable to Asian knotweeds. The results seem to indicate a trade-off hypothesis in the knotweed establishment strategy between hydrogeomorphological constraints and strong interspecific competition. Analyzed in the light of the current literature, our final models are designed to integrate hydrogeomorphological processes in order to provide an operational tool to help river managers locate the areas most susceptible to knotweed invasion and with important implications for managing these species in riparian ecosystems.

Keywords: Reynoutria spp., Hydrogeomorphological processes, Establishment strategy

Asclepias syriaca L. in Ukraine: economic value against environmental impact.

Tetiana Dvirna[1], Liudmyla Zavialova[2], Oksana Kucher[3], Vasyl Budzhak[4], Sergiy Koniakin[5], Olexandr Orlov[6], Nadiia Sytachak[7], Vira Protopopova[8], Anna Kuzemko[9], Myroslav Shevera[10]

(1) M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, 2, Tereshchenkivska Str. 01601, Kyiv, Ukraine
(2) M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, 2, Tereshchenkivska Str., 01601, Kyiv, Ukraine
(3) M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, 2, Tereshchenkivska Str., 01601, Kyiv, Ukraine
(4) Institute for Evolutionary Ecology, National Academy of Sciences of Ukraine, 37, Lebedeva Str., 03143, Kyiv, Ukraine
(5) Institute for Evolutionary Ecology, National Academy of Sciences of Ukraine, 37, Lebedeva Str., 03143, Kyiv,, Ukraine
(6) State Institute "Institute of Environmental Geochemistry, National Academy of Sciences of Ukraine,, 34A, Academician Palladin Ave., 03143,, Kyiv, Ukraine
(7) Institute of Ecology of the Carpathian, National Academy of Sciences of Ukraine, 4, Kozel'nytska Str., 78926, Lviv, Ukraine
(8) Ferenc Rakoczi II, Trnscarpathian Hungarian College of Higher Education, 6, Koshut sq., 90200, Beregove, Trabscarpathian, Ukraine
(9) M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, 2, Tereshchenkivska Str., 01601, Kyiv, Ukraine
(10) M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, 2, Tereshchenkivska Str., 01601, Kyiv, Ukraine
*Corresponding author: dvirna_t@ukr.net

The initial centers of cultivation on the *A. syriaca* as honey-bearing and ornamental plants in Ukraine are private estates and Botanical Gardens from the middle of the 19th c., from the 1930s – Scientific Research Institute of Rubber, as a technical and medicinal plant. Today, seed hairs are used as filler for clothing, and waste as biofuel. However, *A. syriaca* is an invasive alien species as ranked as Medium significance of I-Rank in Ukraine.

From the end of the 19th to the beginning of the 20th century, the escaped plants were noted in the West, Center and South. Lag-phase is about 50–100 years in different regions. The intensification of the distribution of species took place in the Forest zone and Forest Steppe since 2000s and continues now. The species has fully naturalized in anthropogenic and semi-natural habitats (along roads, field borders, fallows, forest edges, etc.) in the plant communities of the synanthropic vegetation. It has been noted in the five classes of vegetation: Koelerio-Corynephoretea canescentis, Digitario sanguinalis-Eragrostietea minoris, Robinietea, Epilobietea angustifolii and Artemisietea vulgaris (it is a diagnostic species of ass. *Asclepiadetum syriacae* of this class).

The species is characterized by high levels of seed productivity, the predominant vegetative method of reproduction variable modes of dispersal, coenotic amplitudes, and CRS-strategy in Ukraine.

Limiting factors of *A. syriaca* distribution in Ukraine are indicators of soil acidity (Acidity), salt regime (Total salt regime), nitrogen content and climate humidity (Humidity). In connection with climatic changes, wider distribution is predicted, with the exception of the Steppe zone.

Keywords: common-milkweed invasive Ukraine.

Machine learning in invasion ecophysiology: novel methods to assess spatio-temporal plant stress from RGB images.

Fenollosa, E.[1,2], Viver-Arqués, I. [1], de la Torre, J.[3], Munné-Bosch, S.[1,2]

(1) Department of Evolutionary Biology, Ecology and Environmental Sciences, University of Barcelona, Avinguda Diagonal 643, 08028, Barcelona, Spain
(2) Institute of Research in Biodiversity (IRBio-UB), Avinguda Diagonal 643, 08028, Barcelona, Spain
(3) Open University of Catalonia, Rambla del Poblenou, 156, 08018 Barcelona

Rapid and large-scale monitoring is essential to understand spatio-temporal processes across invasive species range such as seasonal performance, population dynamics, or spread and colonization. However, traditional eco-physiological stress markers, like spectrophotometry and high-performance liquid chromatography (HPLC), are costly, destructive, and time-consuming, limiting study replicates. Yet, recent advances in machine learning offer promising opportunities for efficient and non-invasive plant stress assessment. To evaluate this potential, we focused on *Carpobrotus edulis*, a highly distributed invasive clonal plant from the order Caryophyllales, known for accumulating betalains—photoprotective red pigments with strong antioxidant capacity. We gathered 3,750 standardized RGB images of *C. edulis* leaves and conducted an eco-physiological characterization on 20 individuals across eight sampling times throughout a year. By measuring traditional stress markers and quantifying chloroplast pigments and betalains by HPLC, we successfully trained machine learning regression algorithms to predict pigment accumulation from RGB images. Notably, in leaves from reproductive ramets, betalain content increased with senescence progression by summer's end, while in non-reproductive ramets, betalain content responded to extreme abiotic conditions (high and low temperatures). Hence, here we prove how RGB images allow us to assess senescence progression and identify stressful periods with strong spatio-temporal resolution on this species, key aspects to model this invader success under current and future environmental conditions. This interdisciplinary approach unlocks the potential of plant ecophysiology to understand invasive species' success and integrates spatio-temporal dimensions through artificial intelligence, offering a valuable tool for invasion biology.

Keywords: machine learning, remote sensing, ecophysiology

Thriving in the unknown: Unraveling the invasive potential of Aptenia cordifolia.

Fenollosa, E.[1,2], Carvajal, C.[1], Capellades, J.[1], Munné-Bosch, S.[1,2], Pintó-Marijuan, M.[1,2]

(1) Department of Evolutionary Biology, Ecology and Environmental Sciences, University of Barcelona, Avinguda Diagonal 643, 08028, Barcelona, Spain
(2) Institute of Research in Biodiversity (IRBio-UB), Avinguda Diagonal 643, 08028, Barcelona, Spain

Invasive species pose one of the biggest threats to global biodiversity. As the costs of eradication escalate with the progression of invasion, prevention becomes the most cost-effective strategy for biodiversity conservation. In 2020, the Spanish Government presented a list of potentially invaders (RD570/2020), which included *Aptenia cordifolia,* a succulent native plant from South Africa, with unknown impacts in the region. To understand its potential and impacts we studied community composition with increasing presence of this species across 64 sites in the Catalan coast in Spain. Our findings revealed a strong plasticity of *A. cordifolia* to occupy different habitats and coexist with different native and exotic species. To delve deeper we selected two contrasting sites were *A. cordifolia* coexist with three different native species each, under low and high irradiance. Seasonally, we quantified photo-oxidative stress markers and functional traits. The results showed that *A. cordifolia* exhibits strong hydric resilience compared to the native species in both sites. During summer, it experienced mild photoinhibition but displayed the highest total antioxidant content among all native species, efficiently reducing lipid hydroperoxides levels. This species' robust antioxidant mechanisms and adaptability play crucial roles in its successful establishment across multiple habitats, ultimately leading to reduced species richness and biodiversity. The strong eco-physiological invasive potential this species underscores the urgency of early eradication measures in the region to prevent further biodiversity impacts.

The status of biological invasions and their management in the Prince Edward Islands

Laura Fernandez Winzer[1,2], Michelle Greve[3], Peter le Roux[3], Katelyn T. Faulkner[1,4], John R. Wilson[1,2]

(1) South African National Biodiversity Institute, Kirstenbosch Research Centre, Cape Town, South Africa
(2) Centre for Invasion Biology, Department of Botany & Zoology, Faculty of Science, Stellenbosch University, South Africa
(3) University of Pretoria, Department of Plant and Soil Sciences, Pretoria, South Africa
(4) Centre for Invasion Biology, Department of Zoology and Entomology, University of Pretoria, South Africa

South Africa updates the national status of biological invasions and their management every three years. Here we focus on the Prince Edward Islands (PEIs), two South African sub-Antarctic territories. More than 75 alien taxa have been introduced historically, but only 45 are currently present, 26 of which are invasive (26, 17 and 6 are plants, respectively). The impacts have been assessed for 20 of the invasive taxa, with five causing major (four plant species) or massive (one mammal) impacts. Although new alien organisms can be introduced as contaminants or stowaways, these pathways are well-regulated and managed, and the probability of new alien taxa arriving is low. Nonetheless, improved monitoring and identification of incursions is needed to ensure that breaches in biosecurity can be identified and closed. Management in practice is defined by the PEIs Management Plan. Ten alien taxa are being actively controlled, nine of which have eradication plans in place. However, there is a mismatch between which alien taxa are regulated, and those that are being managed. Some widespread alien taxa do not currently have cost-effective management tools. We argue that no alien species are wanted at the PEIs and so all alien taxa found should be evaluated for the feasibility of control. We recommend in case of the detection of alien taxa on the islands, a management feasibility assessment and a decision on whether to: a) attempt eradication; b) manage population to reduce impacts; or c) not manage given it is not cost-effective to do so.

Keywords: indicators, interventions

Pinus contorta alters microenvironmental conditions and reduces plant diversity in Patagonian Ecosystems.

Rafael A. García[1,2], Eduardo Fuentes-Lillo[1,2], Lohengrin Cavieres[2,3], Aníbal Pauchard[1,2]

(1) Laboratorio de Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile
(2) Instituto de Ecología y Biodiversidad (IEB), Santiago, Chile
(3) Facultad de Ciencias Naturales y Oceanográficas, Universidad de Concepción, Concepción, Chile

Pinus contorta is a highly invasive tree species that has significant impacts on biodiversity and ecosystems around the world. In Southern Chile, the species has escaped from plantations established mainly in the 1970s and has invaded both forests and treeless environments. A study was conducted to assess the impact of the invasion on microenvironmental conditions in *Araucaria araucana* forest and Patagonian steppe ecosystems and to evaluate the relationship between these changes and the richness and abundance of native and non-native plant species. The study established 24 plots of 100 m2 in each ecosystem along a gradient of *P. contorta* biomass and measured 18 environmental variables and the composition of native and non-native vegetation at a local scale. Results showed that increased pine biomass was associated with differences in microclimatic conditions and soil properties, which were ecosystem dependent and associated with the level of invasion. Reduction in the richness and abundance of native plants was associated with changes in soil properties and the microclimate generated by the invasion. The study confirms that the invasion of *P. contorta* impacts microenvironmental conditions and reduces native plant diversity. Future restoration plans should focus on how environmental changes can influence the recovery of invaded ecosystems, even after the removal of living pine biomass.

Keywords: Araucaria araucana, impacts, tree invasions

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Science in the face of the global change: is planting non-native forest tree species in forests the best solution?

Anna Gazda[1]

(1) University of Agriculture in Krakow, Poland, Department of Forest Biodiversity, Faculty of Forestry, al. 29-Listopada 46, 31-425 Krakow, Poland

For years, non-native forest tree species have been planted in managed forests around the world. Until now, the most common reason for such decisions was mainly economic. Now, in the face of advancing climate change, we have to make responsible decisions: whether planting non-native species will really be the best solution or may be a very risky decision. In many articles you can find results of simulations of the response of native forest tree species to climate change for predicted scenarios. Most authors claim that non-native forest tree species are a better fit. Before making final decisions, let's know the advantages and disadvantages of such a solution. The advantage of this type of meta-analysis is the wide geographical coverage of the collected data. With so much records, we can conclude that non-native forest tree species should be planted. However, there is the other side of the coin: often only climatic factors and knowledge of the biology and ecology of tree species are taken into account. Interactions between native and non-native forest tree species, as well as pests and pathogens and their hosts, are not considered. By doing so, won't we restart processes that could lead to intense forest dieback in the future? To answer this question, at the outset, it is necessary to critically and inspiringly review the results to date and, above all, focus on assessing the predictable degree of threat to non-native species resulting from the observed changes, including those occurring among pathogens and pests.

Keywords: global change, risks, decisions

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Variation in interactions between a host weed and its biocontrol agent across broad climate and spatial gradients.

Ben Gooden[1], Isabel Zeil-Rolfe[1,2], Gavin Hunter[1], John Lester[1], Celeste Linde[2], Louise Morin[1]

(1) CSIRO, Health and Biosecurity, Clunies Ross Street, Canberra, Australia
(2) The Australian National University, Ecology and Evolution, Research School of Biology, Canberra, Australia

Biocontrol agents (BCA) are widely used to help manage the impacts of environmental weeds on recipient ecosystems. BCA efficacy can vary significantly across a weed's introduced range, often in relation to broad ecological and climatic. Wandering trad (*Tradescantia fluminensis*) is an invasive weed that smothers groundcover vegetation in forest ecosystems across eastern Australia, resulting in reduced native vegetation diversity. Here we report on 2.5 years of post-release monitoring data for the leaf-smut fungus *Kordyana brasiliensis* that was released to control wandering trad. The fungus was released in mid-2020 on dense wandering trad infestations at 50 fixed monitoring plots spread over a broad temperate-subtropical forest gradient in south-eastern Australia. Microclimate (humidity, temperature) data were recorded in each plot using Hygrochron iButtons®, and annual rainfall and regional temperate data for each site were obtained from the Australian climate SILO model. After 6-months, the severity of fungal infection increased significantly at all plots, but the magnitude of severity was positively influenced by relative humidity. After 18-months following release of the fungus, wandering trad cover declined in all areas, but the magnitude of decline in foliage cover was greatest in warm, humid climates closest to the equator (~50-60 %), with only moderate declines observed under relatively cool, dry conditions in the southern region (~20 %). The reduction in wandering trad cover persisted until 2.5 years post release (when follow-up monitoring ceased). These results highlight the importance of climate context in predicting BCA establishment and impacts on host weeds at broad spatial scales.

Keywords: Pathogen, biological control

Financing: NSW Environmental Trust

Setting up monitoring programme to assess the beneficial – and potentially unintended – impacts of mouse eradication on a sub-Antarctic island.

Michelle Greve[1]

(1) University of Pretoria, Plant and Soil Sciences, Natural and Agricultural Sciences, Private Bag X20, Hatfield, 0002, Pretoria, South Africa

The eradication of invasive species is undertaken with the aim to restore species, habitats, and ecosystem processes that have been compromised by an invasive species. To assess the efficacy of eradication, it is essential to possess baseline data against which post-eradication biodiversity indicators can be compared. Additionally, because eradication efforts can have unintended outcomes, having a monitoring system in place to respond to unintended impacts is important. Here I report on ongoing efforts of a biodiversity monitoring programme to assess the success, and monitor the impacts, of a planned mouse eradication on sub-Antarctic Marion Island (MI). Along with neighbouring Prince Edward Island (PEI), MI forms part of the Prince Edward Island archipelago. Mice, and many of the invasive plants and insects found on MI, are absent from PEI. Therefore, the Prince Edward Islands comprise an excellent model system in which to test the efficacy of rodent eradication, and to assess whether eradication will result in MI changing to an ecosystem similar to that of the almost pristine PEI post-eradication, or whether MI it will take on a different successional trajectory altogether. Additionally, the Prince Edward Islands have already experienced extensive climate change in the form of drying and warming, which have already affected biodiversity. The comparison of MI with PEI will allow us to disentangle the effects of climate change, vs the effects of mouse eradication, in driving future changes in the biodiversity on Marion Island.

Keywords: eradication, monitoring, climate change

Financing: ASICS Biodiversa

Habitat occupancy by naturalized alien plants: differences between the Old World and New World.

Martin Hejda[1], Alessandra Kortz[1], Josef Brůna[2], Jan Čuda[1], Desika Moodley[1], Ana Novoa[1], Jan Pergl[1], Pavel Pipek[1,3], Kateřina Štajerová[1], Petr Pyšek[1,3]

(1) Institute of Botany, Czech Academy of Sciences, Průhonice, Czech Republic, Department of Invasion Ecology, Zámek 1, Průhonice 252 43, Czech Republic, Průhonice, Czech Republic
(2) Institute of Botany, Czech Academy of Sciences, Průhonice, Department of GIS and Remote Sensing, Zámek 1, Průhonice 252 43, Czech Republic, Průhonice, Czech Republic
(3) Charles University, Department of Ecology, Faculty of Science, Viničná 7, Prague 2, 12844, Czech Republic, Prague, Czech Republic

The SynHab database (www.synhab.com) contains information on habitat affiliations of ~8000 alien plants, naturalized or invasive worldwide. Habitats in the invaded ranges were classified using a simple system, accounting for basic vegetation types. The aim was to use a classification applicable to different climatic zones and biomes that can cope with descriptions of habitats that vary in quality and detail. Ruderal and agricultural habitats, followed by the open forests, rank among the habitats occupied by most naturalized and invasive aliens worldwide. On the contrary, aquatic habitats, saline substrates, and rocks rank among the least invaded habitats. Interestingly, human-maintained grasslands rank among the most occupied habitats in the New World but not in the Old World, suggesting that different adaptations are advantageous for naturalization in these two parts of the world. In particular, the Old World species are adapted to long-term intensive human impact, which provides them with an advantage when invading the human-impacted grasslands in the New World. On the contrary, New World species can be expected to be less adapted to human impacts due to the relatively recent human colonization of the New World. When considering the combinations of habitats occupied by individual aliens, the preliminary results show that open forests in combination with ruderal habitats are most represented, followed by agricultural and riparian habitats, both in combination with ruderal habitats. This pattern confirms that human-induced disturbances act as a vector for naturalized and invasive aliens, promoting their establishment and spread in vegetation.

Keywords: SynHab database, naturalized alien species, invaded habitats

The Genus Kalanchoe in Ecuador: from Gardens to Wildlife.

Ileana Herrera[1,4], Anahi Vargas[1], Jordi López-Pujol[2], Neus Nualart[2], Anne Guézou[3], Carlos Gómez-Bellver[2], Efrain Freire[4], Patricia Jaramillo Díaz[5]

(1) Universidad Espiritu Santo, Ciencias Ambientales, Samborondon, Ecuador
(2) Botanic Institute of Barcelona (IBB)., Barcelona, Spain
(3) Independent researcher
(4) Instituto Nacional de Biodiversidad, Quito, Ecuador
(5) Estación Científica Charles Darwin, Galápagos, Ecuador

The genus *Kalanchoe* native to Madagascar and Tropical Africa, is widely traded for their ornamental value. In this study, we provided an updated list of wild and cultivated *Kalanchoe* taxa in Ecuador; we analyzed the temporal-spatial pattern of their records, and we categorized the degree of invasion for each taxon and its environmental preferences. Our results confirmed the presence of 16 taxa of *Kalanchoe* in the country. Seven species and a hybrid were detected in wildlife. *Kalanchoe densiflora, K. laxiflora, K. pinnata, K. tubiflora*, and *K. × houghtonii* were categorized as invasive. We detected invasive records of some of these plants in protected areas. Almost all taxa had at least one record as cultivated, suggesting that the invasion pathway is ornamental trade. *Kalanchoe pinnata* individuals in wildlife were recorded in the four biogeographic regions of Ecuador, which could be associated with the wide range of precipitation and temperature in which the species may dwell. Our study highlights the importance of reducing the ornamental value and limiting the use of *Kalanchoe* taxa with invasive potential in horticulture and promoting, instead, the use of native species.

Keywords: biological invasions, protected areas, Galapagos

The Weed Remote Sensing Community of Practice (WRS CoP): a new platform to facilitate collaborative research networks, improved education, and uptake of technologies for weed remote detection.

Jane Kelly[1,2], **Hillary Cherry**[3], Remy Dehaan[1,2], Lihong Zheng[1,2], Felipe Gonzalez[4]

(1) Charles Sturt University, Agricultural Environmental and Veterinary Sciences, Science, Boorooma St, Wagga Wagga, Australia
(2) Gulbali Institute Land Water and Environment, Boorooma St, Wagga Wagga, Australia
(3) New South Wales Department of Planning and Environment, NSW National Parks and Wildlife Service, Parramatta, Australia
(4) Queensland University of Technology, Centre for Robotics, Brisbane, Australia
hillary.cherry@environment.nsw.gov.au

Remote sensing is a powerful tool for weed management, with research in this field growing in popularity globally. However, the costly and complex nature of existing technologies can limit uptake. A new Community of Practice aims to break down barriers by facilitating a central platform for knowledge and information sharing that is accessible to all working in this field.

The Weed Remote Sensing Community of Practice (WRS CoP) was developed through a collaborative partnership between Australian academic and government institutions in 2022. The WRS CoP aims to a) link researchers to end-users, b) share learnings and jointly solve problems c) develop research partnerships and other partnering opportunities, and d) refine best practice and promote adoption of weed remote detection. The CoP meets quarterly via virtual meetings that include presentations and discussions around research and field applications of remote sensing to various weeds, and addresses the complexities associated with applying current technologies in a variety of landscapes. Topic areas include: Data acquisition (evolving drone technologies, technical challenges, etc); Data analysis (size, storage, processing constraints, machine and deep learning modelling); information sharing (privacy/IP issues).

Comprising a current membership of over 160 participants from across Australia, New Zealand and Inner Mongolia, there is an opportunity to broaden the WRS CoP internationally. The intent is to build a wide network of resources and expertise that can be used to develop research collaborations and expand knowledge transfer. This poster provides further information on the WRS CoP, including how to join.

Keywords: remote sensing, partnerships, machine learning.

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Relatively new invasive species in Europe: Senecio inaequidens. Review of its biology, distribution, impact and management.

Josef Kutlvašr[1,2], Petr Karlík[3], Jan Pergl[1]

(1) Institute of Botany of the Czech Academy of Sciences, Department of Invasion Ecology, Zámek 1, Průhonice, Czech Republic
(2) Czech University of Life Sciences Prague, Faculty of Environmental Sciences, Kamýcká 129, Prague, Czech Republic
(3) Czech University of Life Sciences Prague, Faculty of Forestry and Wood Sciences, Kamýcká 129, Prague, Czech Republic

The perennial herb *Senecio inaequidens* (Narrow-leaved ragwort) is native to South Africa and has invaded huge areas in Europe, Asia and Africa. The first occurrences in the non-native area were associated with wool-processing factories. Recently, *S. inaequidens* is considered to be among the most rapidly spreading species in Europe. It grows on disturbed soils and spreads mainly along routes, highways and railways, where it becomes dominant. The great threat is that the species begins to permeate into semi-natural habitats. *S. inaequidens* is well known for its toxicity caused by pyrrolizidine alkaloids (PA), leading to liver cirrhosis. Embryotoxicity, mutagenicity and carcinogenicity were proven as well. The impact on humans can be through drinking herbal tea, where ragwort is an undesirable admixture or direct ingestion and, theoretically, also the consumption of honey. Poisoning of animals (cows and horses) by PA was documented in Germany, Switzerland, the Czech Republic and South Africa. *S. inaquidens* is a competitive and allelopathic species posing a negative impact on different trophic levels of the rhizosphere and biodiversity of native plants. The EICAT assessment showed a moderate impact level. On the other hand, it has a positive impact on native pollinator taxa by providing nectar in the late season. Management of the species is troublesome, as mowing does not kill the individuals. Furthermore, even grazing cannot be used due to high toxicity for animals. Hand-pulling is relatively efficient management, but for large invaded areas, herbicide use is necessary.

Keywords: Narrow-leaved ragwort, pyrrolizidine alkaloids

“Naturaleza Intrusa”: Scientific outreach about Invasive Alien Species.

Antonio Lara Cuevas[1,2,3,4], Daniela Gaymer Parada[1,2,3], Sergio Andres Benavides Avendaño[2,4], Gierke Medina[2], Constanza Figueroa[2], Linette Tralma[2], Paola Salamanca[2], Aníbal Pauchard Cortés[1,3], Paulina Sanchez[2,3]

(1) Laboratorio Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile
(2) Naturaleza Intrusa (NI), Concepción, Chile
(3) Instituto de Ecología y Biodiversidad (IEB), Santiago, Chile
(4) Laboratorio de Estudios del Antropoceno (LEA), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile

Invasive Alien Species (IAS) pose a significant threat to biodiversity globally. The rise of commerce and tourism associated with globalization has further exacerbated this issue. One way to address the problem of IAS is increasing awareness about this issue. In response, the “Naturaleza Intrusa (NI)” initiative was created in 2017, supported by the “Laboratorio de Invasiones Biológicas (LIB)”.

This initiative aims to raise awareness about the importance of protecting biodiversity and the impacts that IAS have on nature, and society. NI achieves this through dynamic, participatory, and enjoyable educational activities, as well as digital infographics shared on social media platforms such as Facebook, Instagram, and Twitter.

To date, NI has organized over 15 in-person educational activities, held more than 10 remote talks to various public and social organizations, and participated in over 12 scientific outreach events across Chile. One of the initiative’s significant achievements was the first Invasive Species Week held in Latin America, bringing together over 600 participants in activities such as talks, workshops, interpretive trails, and urban interventions that depict the invasion process in a public space.

Currently, NI is collaborating on various projects, including the management of Red-eared slider turtles in the Canal Ifarle wetland, the development of a board game on invasive species in native forests, and the creation of new didactic experiences on biodiversity and invasive species. NI has proven to be an effective scientific outreach initiative that engages the public in conversations about invasive species and emphasizes the importance of protecting local biodiversity.

Keywords: In-person educational activities, Participatory education, interdisciplinary

Financing: Fondecyt 1180205, Fondecyt 1231616 and ANID/BASAL FB210006.

Is there an effect of Pinus radiata invasion on the regenerative dynamics of remnant *Nothofagus alessandrii* forests after a mega-fire?

Claudia Leal Medina[1], Mauro González[1], Mauricio Galleguillos[2], Javier Lopatin[2]

(1) Universidad Austral de Chile, ICBT, Ciencias forestales y recursos naturales
(2) Universidad Adolfo Ibañez, Ingeniería y Ciencias

This research evaluated the status of three Nothofagus alessandrii (ruil) populations after a mega-fire. A characterization and validation of the severity of the fire was carried out combining satellite and field data, using dNBR and RdNBR indices, where a consistent classification was recorded for high severities where evident damage to the canopy is perceived, but for medium and low severities there were no coincident results due to the heterogeneity of the vegetation. The analysis of regenerative dynamics with emphasis on the invasion of Pinus radiata (pine), showed the presence of multiple regeneration strategies of rowan and other native species in different severities, and a significant invasion in the sites affected by fire with high and medium severities. The analysis of the cumulative growth (ring width) of rowan and pine post-fire allowed comparing means by means of an ANOVA test. It was found that when comparing between species, pine showed a higher cumulative growth than ruil in high severities ($P < 0.05$), and in medium severities there were no significant differences between species. In addition, a mean density of 9762.98 ind/ha was obtained in the sites with a maximum degree of invasion. There is an increase in the vulnerability of this ecosystem due to the effect of the invasion, due to the accumulation of highly combustible biomass and the positive feedback with future fires, in addition to the high degree of competition exerted by pine as a fast-growing species in severely burned areas, contributing to the degradation of these endangered forests.

Keywords: Regenerative dynamics, biological invasions, Nothofagus alessandrii

Financing: Centro del Clima y la Resiliencia CR2 (FONDAP 15110009)

Gardening Responsibly: New tools to reduce the risk of ornamental plant invasions.

Michelle R. Leishman[1], **Hillary Cherry**[2], Aimee Freimanis[3] and Julia Rayment[2]

(1) School of Natural Sciences, Macquarie University, NSW Australia
(2) Dept of Planning & Environment, NSW Australia
(3) EcoHort Pty Ltd, Glenhaven NSW Australia

Globally, ornamental plant trade has been a pathway for alien plant invasions, resulting in substantial biodiversity impacts. However, few mechanisms exist to understand the invasion risk of ornamental plants. The Gardening Responsibly initiative uses novel risk assessment tools and behaviour change theory to make it easy to identify 'low invasive risk' garden plants. We found that plant suppliers and consumers did not want to buy or sell 'weeds' but did not understand the risk. To increase understanding, we paired scientific plant risk assessments with a new 'eco-label' to easily identify low risk plants. Our eco-label uses nudge theory and behavioural economics to establish a new gardening behaviour - 'check your choice'. Eco-labels identify 'low risk' plant choices for plant sellers and consumers. The eco-label is underpinned by a transparent plant risk assessment process that classifies ornamental plant species and cultivars according to invasive risk. Species assessed as a low risk are promoted while species assessed as a high risk do not qualify for the eco-label. The Gardening Responsibly website includes a research portal where risk assessment tools, databases and outcomes are freely accessible. This voluntary initiative uses market forces to increase the use of low-risk plants, and ultimately elicit long-term attitudinal and behavioural change to generate positive environmental outcomes. This poster presents the Gardening Responsibly tools; opportunities to contribute to the database of ornamental plant risk assessments and invasive plant traits; and international partnership opportunities. The program and tools provide a model that is readily adapted for international use.

Keywords: ornamental-plant risk assessment, behaviour change, prevention

Impact and Management of Range Expanding Rosaceae Species Along Elevational Gradients in the Maloti Drakensberg.

Lesego Malekana[2], Vincent Ralph Clark[1], Sandy Steenhuisen[2], Grant Martin[3], Jake Alexander[4]

(1) University of the Free State, Department of Geography, Natural and Agricultural Sciences, Kestell Road, Phuthaditjhaba, South Africa
(2) University of the Free State, Department of Plant Sciences, Natural and Agricultural Sciences, Kestell Road, Phuthaditjhaba, South Africa
(3) Centre for Biological Control, Department of Zoology and Entomology, Natural and Agricultural Sciences, Rhodes Univerisity, Makhanda, South Africa
(4) ETH Zürich, Department of Environmental Systems Science, Institut für Integrative Biologie, CHN H 66 Universitätstrasse 16, 8092 Zürich, Switzerland

Woody plant species in mountain systems worldwide are expanding their elevational ranges, driven by both global warming and human activity. Native and non-native woody Rosaceae species follow this trend in the Maloti-Drakensberg Mountain region of southern Africa. Here we aimed to determine the impact of *Cotoneaster pannosus* Franch, *Pyracantha angustifolia* (Franch.) C.K. Schneid, *Rosa rubiginosa* L., and the native species *Leucosidea sericea* Eckl. & Zeyh, (all Rosaceae) on native biodiversity at different altitudes in Maluti-Drakensberg. In addition, we aimed to determine what happens when conventional control measures (managed) are implemented. To do this we used six sets of plots (managed, unmanaged, and natural control) at three different elevations (1400,1500 and 1600 masl). There were significant impacts of invasive Rosaceae on native vegetation with reduced native grass biodiversity in invaded plots. Once cleared we found significant temperature and light intensity differences between cleared and uncleared plots which should contribute to vegetation recovery in previously invaded areas. It is hoped that native biodiversity will return to cleared plots, however, continued monitoring is required to confirm this. Our study's results will undoubtedly contribute to the management of invasive species in mountain systems, effectively reducing their negative impacts. Furthermore, our study will have profound implications for our understanding of how climate change and elevation may affect the management and recovery of invasive species.

Keywords: Invasion, elevation, alien species

Financing: My institution will be making the payments.

Establishment and early impacts of the first biocontrol agent against an invasive plant in continental Europe.

Marchante, E. [1], López-Núñez, F.A. [1,2], Duarte, L.N. [1,2], Nunes, A.S. [1,2], Heleno, R. [1], Freitas, H. [1], Marchante, H [1,2.]

(1) Centre for Functional Ecology – Science for People & the Planet, Department of Life Sciences, University of Coimbra, Coimbra, Portugal.
(2) Polytechnic Institute of Coimbra, Coimbra Agriculture School, Coimbra, Portugal.
*Corresponding author: emarchante@uc.pt

Classical biocontrol is key to successful management of invasive alien plants, although it is relatively new in Europe. Post-release monitoring is essential to assess the effectiveness of a biocontrol agent (BCA). Here we present results from post-release monitoring of the Australian gall-wasp Trichilogaster acaciaelongifoliae to control the invasive plant Acacia longifolia; this is the first BCA intentionally introduced against an invasive plant in continental Europe. This BCA was released in South Africa in early 1980 and released in Portugal in 2015 along the coast. Since then, we monitored the establishment, spread and first impacts of T. acaciaelongifoliae on target and non-target plants in Portugal. Galls were imported from South Africa, and so the BCA had to synchronise its life cycle with the seasons and phenology of host-plants in the northern hemisphere. Currently, the BCA is established along the Portuguese coast, and in some inland locations. Where establishment occurred in the first years of release, impacts on reproductive output and vegetative growth of A. longifolia are evident, with reduced seed production and less vegetative growth. No galls were detected on non-target plants. Interaction networks of plant-galls and associated communities were constructed and so far no indirect effects have been detected. As the BCA is now widespread, a citizen science project has been initiated to involve the community in monitoring T. acaciaelongifoliae, helping to increase the scale of monitoring and also to raise awareness about biocontrol in Portugal.

Keywords: biological control; Acacia longifolia; direct and indirect effects

Invasive aquatic plants in the Mondego River basin (Portugal) and efforts to improve management.

Sílvia Martins[1,2], Jael Palhas[1,2], **Elizabete Marchante**[2], Hélia Marchante[1,2]

(1) Polytechnic Institute of Coimbra, Coimbra Agriculture School, Coimbra, Portugal
(2) Centre for Functional Ecology – Science for People & the Planet, Department of Life Sciences, University of Coimbra, Coimbra, Portugal

The ecological and socio-economic impacts of invasive aquatic plants pose a threat to the conservation of aquatic ecosystems and seriously affect ecosystem services. Mondego River basin (Coimbra Region, Portugal) is the area of Portugal where more aquatic invasive plants are established: the most common species are *Eichhornia crassipes* and *Myriophyllum aquaticum*, but several others are present, for example, *Azolla filiculoides, Crassula helmsii, Egeria densa, Lagarosiphon major, Ludwigia peploides, L. grandiflora*, etc. To deal with these threats, several management projects are under way, particularly in the lower part of the Mondego River. Physical control actions (namely manual and mechanical removal and containment with floating barriers) are being implemented to halt the expansion mainly of *E. crassipes* in the lower Mondego River and occasionally actions targeting other invasive species and locations. The management of invasive plants poses complex technical, social and even political challenges. Therefore, collaboration between scientists, technicians, politicians and local populations is essential, which has been attempted in these projects involving several municipalities and regional authorities. The results of management actions have been monitored in order to adapt subsequent interventions, bringing together the various interests and points of view, and ultimately contributing to safeguarding biodiversity and the services of these important ecosystems. However, the extensive areas invaded by *E. crassipes*, the detection of more invasive aquatic plant species and the need for continuous controls, and corresponding associated investments, remain a challenge to last, at various levels.

Keywords: aquatic plants, management of invasive plants, Eichhornia crassipes

Ten years of Acacia mangium control in French Guiana: from awareness to engagement of stakeholders.

Alexandre Mathieu[1], Anna STIER[1], Charles-Elie MARGIER[1], Alizée RICARDOU[1], Clémentine COUTEAUX[1]

(1) Groupe d'Etude et de Protection des Oiseaux en Guyane, 431 route d'Attila Cabassou, Rémire Monjoly, French Guiana

The Amazonian savannas of French Guiana are rare and of high ecological and cultural value but are also threatened by changes in fire regimes, agricultural practices, infrastructure development and by the introduction and the spread of the invasive tree *Acacia mangium* since a couple of decades. As humid tropical forests cover 96 % of its surface and are highly resilient to invasive plant species, and as demographic development is just ongoing, the awareness of biological invasions is extremely recent in this French overseas territory.

Through the european program Life+ CAP DOM (2011 – 2015), growing concern about this IAS led to improve knowledges on the ecology and public perceptions on savannas, to provide a technical management guide and to lay the foundation to build policies for the conservation, management and promotion of this highly singular natural and cultural heritage.

The current invasion of *A. mangium* has help to raise awareness among the stakeholders about the emergency of developing a control plan. Coordinated by the GEPOG, as part of the LIFE BIODIV'OM (2018 – 2024), the « Control Plan of *Acacia mangium* in French Guiana » has been built collaboratively with the mobilization and participation of more than 50 stakeholders from 20 regional and national institutions.

Here we provide results on how coproductive approaches, top-down deliberation and coproduction, and inclusion of a wide range of socioeconomic, cultural and institutional factors have led to a complete engagement of stakeholders in the control of *Acacia mangium i*n French Guiana.

Keywords: Acacia mangium, control, stakeholder

Financing: The LIFE BIODIV'OM is financing by EU, CDL, MTE, DGTM, CTG and OFB

Seed dispersal and germination of Cotoneaster pannosus on Afromontane grasslands of eastern Free State, South Africa.

Karabo Thato Moloi[1], Grant D Martin[2,3], Sandy-Lynn Steenhuisen[1]

(1) Afromontane Research Unit, and Department of Plant Sciences, University of the Free State, Qwaqwa Campus, Phuthaditjhaba, South Africa
(2) Centre for Biological Control, Department of Entomology and Zoology, Rhodes University, Makhanda, South Africa
(3) Afromontane Research Unit, and Department of Zoology and Entomology, University of the Free State, Qwaqwa Campus, Phuthaditjhaba, South Africa

Shrubs from the Rosaceae family have become emerging invasive alien plants in the montane grasslands of South Africa. The most common of these species include Cotoneaster pannosus and Pyracantha angustofolia. We explored the seed dispersal and germination of C. pannosus that has established in montane grasslands of the eastern Free State, notorious for forming monocultures which can outcompete natives. This was achieved through identification of seed dispersers using observations and remote cameras; and by exploring the germination success and rate of C. pannosus seeds ingested by frugivorous birds used in feeding experiments with seeds comprised of three treatments: whole fruits, manually de-pulped seeds, and excreted seeds. Footage and direct observations revealed that indigenous birds and mammals consumed C. pannosus fruits. Aviary experiments showed that fruits were eaten whole with retention times of 15 minutes. The germination success was >5% over all treatments. Germination rates for seeds buried as whole fruits were longer (160 days) than the excreted and manually de-pulped seeds (80 days). In conclusion, birds were confirmed as consumers of C. pannosus fruits and therefore seed dispersers, but unlike with other invasive Rosaceae species such as P. angustifolia, ingestion by birds is not as necessary for breaking seed dormancy. However, pulp removal improves germination, regardless of whether this is achieved through bird ingestion or manual de-pulping. Future field studies focusing on seed dormancy, germination, and seedling survival rates of C. pannosus need to be conducted and will be useful regarding management of this invasive species on an ecosystem level.

Keywords: aviary experiment, camera trap, invasive Rosaceae

Financing: We acknowledge funding from Afromontane Research Unit, Centre for Biological Control and UFS research office; and support from Duncan Martin, and Clarens Conservancy.

Management strategies to reduce invasive pine spread and impact in Patagonian grasslands.

Jaime Moyano[1], Bárbara Langdon[3], Stephen Palmer[2], Aníbal Pauchard[3], Martin Nuñez[1,4]

(1) INIBIOMA, CONICET, Universidad Nacional del Comahue, Grupo de Ecología de Invasiones, Quintral 1250, San Carlos de Bariloche, Argentina
(2) University of Aberdeen, AB24 2TZ, Aberdeen, United Kingdom
(3) Universidad de Concepción, Laboratorio de Invasiones Biológicas, Victoria 631, Concepción, Chile
(4) University of Houston, Department of Biology and Biochemistry, TX, 77204, Houston, USA

There is an urgent need to design management strategies for invasive species that are effective in reducing their range and impact. The long-term nature of most biological invasions makes them very difficult to study on the field, so the use of simulation models becomes key. Woody plants are among the most noxious invaders, especially in treeless ecosystems, such as grasslands. In this study, we compared different management strategies aimed at reducing the spread and impact of a woody invader, *Pinus contorta* (hereafter pine), on native grasslands in Patagonia. We used an individual based model (Range Shifter) to simulate an invasive pine population during 50 years, starting from a plantation adjacent to a native grassland. We delayed control actions 0, 10, 20, 30 or 40 years to assess the consequences of delaying management actions. We targeted different life stages for control: seedlings, saplings, young adults, mature adults or all four stages. We selected cells for control actions at different locations of the landscape, according to different prioritization criteria: random selection, biased towards recently colonized cells, reactive to incurred impact on grassland productivity and weighted by cell population size. We combined these three factors to obtain 100 management strategies. We found that avoiding delay in management actions and targeting saplings were most effective to slow down pine spread, minimize their impact on native grassland productivity and reduce pine population size. These results will help guide the management of invasive pines in Patagonia to prevent their spread and reduce their impact.

Keywords: Pinus, Impact based management, Simulation models

Financing: This research was funded under the Latin American Biodiversity Programme as part of the Newton Fund (NE/S011641/1), and by the Argentine National Scientific & Technical Research Council (CONICET,-2019- 74-APN-DIR#CONICET).

Fire, life histories, and plant invasion.

Korina Ocampo-Zuleta[1,2,3], Susana Paula[2,3,4], Juli G. Pausas[3,5], Lohengrin A. Cavieres[4,6], Ángela Sierra-Almeida[6,7], Susana Gómez-González[3,8,9]

(1) Programa de Doctorado en Ciencias mención Ecología y Evolución, Universidad Austral de Chile, Escuela de Graduados, Facultad de Ciencias, Avenida Rector Eduardo Morales Miranda, Edificio Pugín, 5090000, Valdivia, Chile
(2) Instituto de Ciencias Ambientales y Evolutivas, Universidad Austral de Chile, Avenida Rector Eduardo Morales Miranda, Edificio Pugín, 5090000, Valdivia, Chile
(3) Center for Fire and Socioecological Systems (FireSES), Universidad Austral de Chile, Campus Isla Teja, 5090000, Valdivia, Chile
(4) Institute of Ecology and Biodiversity (IEB), Victoria 631, Barrio Universitario, Concepción, Chile
(5) Centro de Investigaciones sobre Desertificación, Spanish National Research Council (CIDE-CSIC), Ctra. Náquera Km. 4.5 (IVIA), Montcada, 46113, Valencia, España
(6) Departamento de Botánica, Facultad de Ciencias Naturales y Oceanográficas, Universidad de Concepción, Concepción 4070386, Chile
(7) Cape Horn International Center (CHIC), Universidad de Magallanes, Teniente Muñoz 166, 6350000, Puerto Williams, Chile
(8) Departamento de Biología-IVAGRO, Universidad de Cádiz, Campus Río San Pedro, 11510, Puerto Real, España
(9) Center for Climate and Resilience Research (CR)2, Blanco Encalada 2002, 8370449, Santiago, Chile

An open question in ecology is whether changes in the natural fire regime favor alien plants, plants with specific life forms, or phylogenetic relationships. We evaluated the role of species origin (native vs. alien), life span, and life form in determining the germination responses to fire-cues in plant species inhabiting the matorral communities of Central Chile, where natural fires and fire adaptations are infrequent. We compiled a database on the germination responses to fire cues (stimulation or inhibition to heat and/or smoke) of 70 Chilean matorral species. To do this, we extracted data from published studies and incorporate data from our own germination experiments. We included information on the species' origin (native or alien), life span (annual or perennial), and life form (woody or herbaceous). We performed GLMM to determine the effect of these factors on the frequency of stimulation and inhibition responses, including the taxonomy to account for the evolutionary relatedness of the studied species. We found that inhibition responses to fire cues were more prevalent in native, perennial, or woody species. In addition, the frequency of stimulation was not affected by any of the factors studied. Our findings suggest that the success of the post-fire invasion in the Chilean matorral might be explained by the fire-induced inhibition of the germination of native perennial plants (which are not fire-adapted) and the tolerance of the alien species (mostly annuals), which would that take advantage of empty niches left by native species.

Keywords: Fire-cues, germination, life-history traits

Financing: ANID PhD fellowship 2019 No. 21190817 (Chile), the VIDCA grant from the Universidad Austral de Chile No. TD-2021-01 and AUIP mobility grant. ANID PIA/BASAL FB210006 (Chile).

Evaluation of gorse control strategies in a livestock establishment of Uruguay.

Rodrigo Olano[1], Carolina Munka[1], Alejandra Borges[2], Fernanda De Santiago[1], Lucia Perez[1], Daniella Bresciano[1]

(1) Universidad de la República, Sistemas Ambientales, Facultad de Agronomía, Garzon 780, Montevideo, Uruguay
(2) Universidad de la Republica, Biometría, Estadística y Computación, Facultad de Agronomía, Garzón 780, Montevideo, Uruguay

Gorse (Ulex europaeus L.) is a shrubby legume native to Western Europe, considered one of the 100 most problematic invasive species in the world. In Uruguay it was introduced voluntarily and currently seriously affects natural grassland and forest crops. We evaluated the effect of various control measures on the regeneration and recruitment process of gorse in a livestock establishment in the east of the country. Plots with gorse patches of two sizes (large and medium) were selected. Three treatments are applied: cutting (C), cutting + grazing (CG) and cutting + herbicide + grazing (CHG) in complete blocks at random with three repetitions. In the CHG treatment, herbicide (picloram) was applied only at the beginning of the experiment, immediately after cutting. Seasonal sampling of all plots was carried out. Results indicated that the CG treatment reduced the average height of the treated adult plants, in relation to the C treatment. In the case of the CHG treatment, from the first sampling there was no regrowth of the plants one year after the herbicide was applied. There were no differences in the perimeter of the plants between treatments C and CG and, in the case of recruitment, there was no consistent pattern between the size of the patch. In the large patch size, the CHG treatment achieved lower recruitment, but, in the case of medium patches, it was the one with the highest number of seedlings. Control measures are currently being evaluated in the study area.

Keywords: Recruitment, Invasion, Regeneration

Financing: Comisión Sectorial de Investigación Científica UdelaR

Can invasive species be part of multifunctional landscapes? Exploring values and perceptions.

Andrea Monica Ortiz[1], Aníbal Pauchard Cortés[1,2]

(1) Instituto de Ecología y Biodiversidad, Victoria 631, Barrio Universitario, Concepción, Chile
(2) Laboratorio de Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile

The central-south regions of Chile are notable for large swaths of plantations of exotic pines and eucalypts, which have had significant social and ecological impacts. In February 2023, wildfires in the region caused massive losses and damages to these plantations, biodiversity and human communities. These events have re-invigorated discussions on how to increase the resilience and multifunctionality of the landscapes in the region. However, the multiple actors and their diverse objectives that share and shape the landscape mean that there are significant challenges to be overcome in order to find a common vision and create sustainable multifunctional landscapes. Considering that exotic trees grown for timber and pulp are considered invasive in Chile, it becomes important to document the perspectives on invasive species, particularly those used by the private forestry industry, and their role in multifunctional landscapes.

Building on previous research conducted on the feasibility of implementing multifunctional landscapes in central-south Chile with key knowledge holders, here we invoke a values-based approach to analyze the complex relationships and explore the perceptions and values that people have regarding the role of the private forestry industry, and towards invasive alien species more generally. We find that the heavy presence of exotic timber species in the landscape, and the formidability of the timber and pulp industries in the central-south regions of Chile signify that discussions around multifunctional landscapes need to account for the productive sector and include them in dialogue, while also insisting for the improvement of practices and policies to reduce environmental impacts.

The aromaticity of plants as an organoleptic characteristic that influences the dynamics of forest fires in Roble-Laurel-Lingue forests in south-central Chile.

Valeria Palma[1], Octavio Toy-Opazo[1,2,3], Rodrigo Demarco[4], A. Fuentes-Castillo[4], A. Fuentes-Ramírez[1,2]

(1) Laboratorio de Ecosistemas y Bosques (EcoBos), Departamento de Ciencias Forestales, Universidad de la Frontera, Temuco, Chile.
(2) Centro Nacional de Excelencia para la Industria de la Madera (CENAMAD). Pontificia Universidad Católica de Chile, Santiago, Chile.
(3) Programa de Magíster en Manejo de Recursos Naturales, Facultad de Ciencias Agropecuarias y Medioambiente, Universidad de la Frontera, Temuco, Chile.
(4) Departamento de Industrias, Universidad Técnica Federico Santa María, Valparaíso, Chile.

In central-southern Chile, the occurrence and area affected by forest fires increases, presenting a high percentage of intentionality in the last 10 years, which leaves the remnants of native forest facing a scenario of vulnerability, especially the association Oak-Laurel-Lingue. This is accentuated due to its proximity to forest plantations and its predominant location in urban-rural interface áreas. The Roble-Laurel-Lingue forests present organoleptic characteristics that distinguish them from other forest associations given the aroma of some species. Due to previous studies, it is possible to determine that aromatic species have a characteristic chemical composition, and that this characteristic would be associated with high flammability. In this way, it is relevant to study whether, in fact, the aromatic species of this forest association are more flammable than the non-aromatic ones. This is evaluated through an analysis of the chemical composition and flammability characteristics of the vegetation using the integral ignition method, contrasting ignition parameters, consumability, sustainability and combustibility of the native species Laurelia sempervirens, Persea lingue, Aristotelia chilensis, and the non-native Acacia melanoxylon and Eucalyptus globulus. It is expected that these results will be an initial contribution to the flammability studies of the Roble-Laurel-Lingue forest association of central-southern Chile, as well as to the urban-rural interface áreas of the La Araucanía region. The study of organoleptic properties can be important in the dynamics of forest fires and be a contribution to their prevention and forest management.

Keywords: Flammability, forest fires, native forest.

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From South America to China: Biogeography of the invasiveness of *Alternanthera philoxeroides*.

Xiaoyun Pan[1], Yuanfei Pan[1], Alejandro Sosa[2]

(1) Ministry of Education Key Laboratory of Biodiversity Science and Ecological Engineering, School of Life Sciences, Fudan University, Shanghai, China
(2) Fundación para el Estudio de Especies Invasivas (FuEDEI), Hurlingham, Buenos Aires, Argentina

Ecologists have long puzzled over why a small number of alien species could successfully invade a wide range of areas around the world. To date, the preponderance of studies focusing on the causes of invasion success have been limited to the scale of a single community or ecosystem. Besides comparisons between the native and invaded ranges of a species, a biogeographic approach to understanding variation in invasiveness has rarely been undertaken.

Alligator weed (*Alternanthera philoxeroides* (Mart.) Griseb.) is a globally invasive plant with significant negative impacts on the environment, agriculture, economy, and health. Here, for the first time, we report our research progress on biogeography of the invasiveness of *Alternanthera philoxeroides* from four aspects: (1) plant- herbivores interaction; (2) plant-fungal endophytes interactions; (3) plant-soil feedbacks; (4) plant kin group interactions.

A thorough review of biogeography of plant invasiveness is vital to future management decisions. Besides, we hope both some new mechanisms and the open questions identified in this review will stimulate further research on the ecology and evolution of alien plants.

Invasive plant species across elevational gradients: How different functional groups perform in the Andes mountains of Chile.

Aníbal Pauchard[1,2], Alejandra Jiménez[1,2], Eduardo Fuentes-Lillo[1,2], Rafael Andres García[1,2]

(1) Laboratorio de Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile.
(2) Instituto de Ecología y Biodiversidad (IEB), Santiago, Chile

Non-native plant invasion in mountains are driven both by extreme environmental conditions as well as anthropogenic drivers. In the Andes of south-central Chile, we aim to determine whether functional traits of non-native plants drive their successful establishment in disturbed and undisturbed plant communities. We performed a factorial experiment with the addition of non-native seeds (*Acacia dealbata, Pinus radiata, Lupinus arboreus, Rosa rubiginosa, Trifolium repens, Bellis perennis, Poa pratensis, Lolium perenne*) with different growth forms and with or without nitrogen fixation. Seeds were sown at 3 elevations on 12 roads across a latitudinal gradient (33°-54°S) in the Andes Mountains of Chile. The results indicated that the disturbance explains 31.2% of the variance of the probability of occurrence in the highlands, followed by the functional traits that explain 15% of the variance, mainly explaining the probability of establishment in the lowlands. *L. arboreus* was the most successful species in establishing in both lowland and highlands. Combining with field sampling data using the MIREN protocol (www.mountaininvasions.org), these results can help us understand how disturbance and nutrient availability drive the success of invasions and the redistribution of non-native plants. Reducing anthropogenic disturbances and limiting the introduction of new species with specific traits is critical to prevent biological invasions in the Andes and other mountain ranges.

Keywords: mountain invasions, field experiment, functional traits

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Impact of alien and native plants on vegetation and soil: from herbs to woody species.

Jan Pergl[1], Małgorzata Stanek[4], Zygmunt Dajdok[5], Martin Hejda[1], Paweł Kapusta[4], Josef Kutlvašr[1,2], Lenka Moravcová[1], Irena Perglová[1], Petr Pyšek[1,3], Jiří Sádlo[1], Anna M. Stefanowicz[4], Sławomir Sułowicz[6], Barbara Tokarska-Guzik[6], Michaela Vítková[1], Blanka Wiatrowska[7]

(1) Institute of Botany, Czech Academy of Sciences, Department of Invasion Ecology, Zámek 1, Průhonice, Czech Republic
(2) Czech University of Life Sciences Prague, Faculty of Environmental Sciences, Praha – Suchdol, Czech Republic
(3) Charles University, Department of Ecology, Faculty of Science, Prague, Czech Republic
(4) W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków, Poland
(5) University of Wrocław, Department of Botany, Faculty of Biological Sciences, Wrocław, Poland
(6) University of Silesia in Katowice, Institute of Biology, Biotechnology and Environmental Sciences, Faculty of Natural Sciences,, Katowice, Poland
(7) University of Life Sciences in Poznan, Department of Botany and Forest Habitats, Poznań, Poland

There is a high demand from nature conservation to clarify the role of alien and native dominant species in the ecosystems. Here we summarize results from our previous project that aimed at identifying the impact of alien and native dominant herbaceous plants and outline a recently started analogous project focusing on woody species. Even though there were no clear differences in impact attributable to the native or alien status of herb species, we could identify pairs of dominants according to their life history and compare their net impacts. There were strong dominants within both groups, and the impact differed with regard to the species identity. The patterns were similar for impact on vegetation (Hejda et al., Preslia 2021) as well as on soil (nutrient availability and biological activity) (Pergl et al., PPEES 2023). In a recently started project, we study the same types of impacts – on vegetation, soil properties, and activity of soil biota – at different times of vegetation season and on a large geographical scale (Czechia, Poland, Slovakia) to find out whether the impacts by woody species follow the same pattern as those by herbaceous ones. Moreover, we added the assessment of enzymatic activities as a measure of soil activity and next-generation sequencing methods to evaluate their potential for measuring impact. We selected woody species already known for their negative impact, such as aliens *Ailanthus altissima, Robinia pseudoacacia*, and *Prunus serotina*. Within native dominant trees are *Quercus robur* and *Acer platanoides* or shrubs like *Prunus spinosa*.

Keywords: impact, alien plants, native plants

The impact of invasive plants on large herbivores in Kruger National Park: how to measure it and what it really means for nature conservation?

Klára Pyšková[1,2], Ana Novoa Pérez[1], Jan Čuda[1], Llewellyn Foxcfrot[3,4], Martin Hejda[1], Khensani Nkuna[3], Petr Pyšek[1,2]

(1) Institute of Botany, Department of Invasion Ecology, Czech Academy of Sciences, Průhonice, Czech Republic
(2) Charles University, Department of Ecology, Faculty of Science, Viničná 7, Prague Czech Republic
(3) Scientific Services, South African National Parks, Private Bag X402, Skukuza, South Africa
(4) Centre for Invasion Biology, Department of Botany and Zoology, Stellenbosch University, Stellebosch, South Africa

Kruger National Park is one of the most important protected areas in Africa, representing a typical savanna ecosystem where rivers play a key role in animal survival. While protected areas serve as refuges from invasive species, few are completely free of alien species, which is also the case of Kruger National Park. Here we focus on three riparian invasive plants (*Parthenium hysterophorus, Xanthium strumarium* and *Datura inoxia*) and their impact on the communities of large herbivores. Such knowledge is completely lacking in this protected area, yet it is important for park management. To find out whether the patterns of habitat utilisation by herbivores are affected by the target invaders and whether the invasive plants serve as a food source for them, we selected 18 experimental sites along five perennial rivers throughout the park. In those sites, vegetation and soil surveys have also been done (rainy season 2022/2023). In November 2022, we placed 42 camera traps to monitor areas dominated by the invasive species and control uninvaded areas nearby to compare the visitation rates of large herbivores and their grazing behaviour. To explore if the animals feed on the invasive plants, we collected feces samples of five selected herbivore species (waterbuck, hippo, elephant, buffalo and impala), and applied DNA meta-barcoding to get a complete list of plants in their diets to assess the contribution of the target invaders. This approach allowed us to estimate the impact of invasive plants based on monitoring the grazing behaviour and habitat utilisation by herbivores.

Keywords: herbivory, savanna, impact

The invader shrub *Chrysanthemoides monilifera* (boneseed) negatively impacts native plant communities in a Mediterranean zone in Central Chile.

Sebastián A. Reyes[1], Cristian Atala[1], Orlando Jeldes-Cajas[1], Josefa Osses[1], Reinaldo Vargas[2]

(1) Pontificia Universidad Católica de Valparaíso, Instituto de Biología, Facultad de Ciencias, Avenida Universidad 330, Placilla, Valparaíso, Chile
(2) Universidad Metropolitana de Ciencias de la Educación, Departamento de Biología, Facultad de Ciencias Básicas, Av. José Pedro Alessandri 774, Ñuñoa, Santiago, Chile

Biological invasions have severe social, economic and ecological repercussions. Central Chile is a biodiversity hotspot but also a highly disturbed area containing many invasive plant species such as *Chrysanthemoides monilifera* (L.) Norl. This shrub is present close to the coast and is considered an aggressive invasive species with allelopathic effects in other countries. Despite being ubiquitous, its invasive potential and ecological impact has not yet been evaluated in Chile. Here, we aim to determine the effect of the invasive *C. monilifera* on local plant communities and test for possible allelopathic effects on the germination of native and other invasive species. To do this, we analyzed plant diversity in patches with and without the invader in two sites in Valparaíso, Chile. Additionally, we conducted an experiment testing the effect of different concentrations (0, 25, 50 and 100%) of the aqueous extract of the leaves on the germination of both a native and an invasive shrub. We found that *C. monilifera* negatively impacts local plant diversity, especially endemic species. Also, its leaf extract inhibited the germination of the native shrub, especially at higher concentrations (50 and 100%), but do not inhibit the germination of the invasive shrub. This will likely result in a rapid change in the plant community, with negative impacts on the native species and an increase in invasive and introduced species, further degrading this already altered ecosystem. Developing strategies for the control of *C. monilifera* are urgent to limit its spread and negative ecological impact in Chile.

Native vegetation structure, landscape features, and climate shape non-native plant richness and cover in New Zealand native shrublands.

Laureline Rossignaud[1,2], Philip E. Hulme[1,2]

(1) Lincoln University, Pest Management and Conservation, Agriculture and Life Sciences, PO Box 85084, Lincoln, New Zealand
(2) Lincoln University, Bioprotection Aotearoa, Agriculture and Life Sciences, PO BOX 85084, Lincoln, New Zealand

Studies investigating the factors that lead to plant invasions have largely focused on the role of native plant species richness and rarely included other potential covariates. Here, we explored how vegetation structure, landscape features and climate shapes non-native plant invasions in native shrublands distributed across New Zealand. We examined non-native species richness and mean species ground cover in relation to vegetation structure (native richness and cumulative cover at ground, understory, and canopy tiers), landscape features (proportion of adjacent anthropogenic land cover, distance to nearest road or river) and climate. Generalised additive models were run to assess which variables were determining non-native richness and mean ground cover and whether these variables had a similar effect on native species in the ground tier. A positive relationship between native and non-native ground richness was not due to similar responses to the variables examined in this study. Higher native canopy richness resulted in lower non-native richness and mean ground cover, contrasting with a higher native ground richness. Non-native richness and mean ground cover increased with adjacent anthropogenic land cover, whereas for native richness and mean ground cover this relationship was negative. Non-native richness increased in dryer areas, while native richness was influenced by temperature. Adjacent anthropogenic land cover seems to not only facilitates non-native species arrival by being a source of propagules but also aids their establishment as a result of fragmentation. Our results highlight the importance of examining both cover and richness in different vegetation tiers to better understand non-native plant invasions.

Keywords: biological invasions, biotic resistance, propagule pressure

How rural communities perceive the invasion of Pinus radiata in south-central Chile? Inputs for community control programs.

Pabla Catalina Sánchez Fuentes[1,2], Cristóbal Pizarro Pinochet[1,2], Aníbal Pauchard Cortés[1,2], Barbara Andrea Langdon Fornet[1,2]

(1) Laboratorio de Invasiones Biológicas (LIB), Universidad de Concepción, Facultad de Ciencias Forestales, Concepción, Chile
(2) Instituto de Ecología y Biodiversidad (IEB), Santiago, Chile

Invasive non-native species affect biodiversity, ecosystem services, and human well-being. In this context, rural communities possess valuable local ecological knowledge. Therefore, understanding the perceptions of local communities is an essential step towards creating engagement and trust with key stakeholders. Moreover, it is crucial when implementing invasive species management strategies to have the support of local actors, as they are interested in what happens in their surroundings. The research question guiding this study is: what is the willingness to participate in community control programs, the level of invasion knowledge, and the overall perception of rural communities about the *Pinus radiata* species in central Chile? The general objective is to evaluate the factors that influence the interest of rural communities in the central zone of Chile in participating in *Pinus radiata* invasion control programs in the context of forest fires. Face-to-face surveys will be conducted in the communes of Constitución, Florida, Huepil and Santa Juana, where demographic, economic, knowledge, landscape context, and species effects are evaluated. A design of quantitative methods is applied, which focuses on measuring and quantifying the attitudes and perceptions of rural communities. It is expected that younger people or those with a good socio-economic status, as well as those who have lived in the area for longer periods and perceive negative effects from the species, will be interested in participating in community control programs, while those who perceive benefits will not be interested in participating.

Keywords: Pinus radiata, Social perception, Rural communities

Strategies upon strategies - bringing biosecurity RD&E together in Australia and opportunities for international partnerships.

Matt Sheehan[1], Potter Shauna[1]

(1) Wild Matter Pty. Ltd., !0 Templeton Street, Castlemaine, Australia

Biosecurity research, development and extension (RD&E) is a complex policy space that encompasses a broad range of invasive organisms across many sectors. Within a landscape of increasing risk, funding competition and an aging workforce, the strategy presents an opportunity to strengthen linkages both nationally and internationally by focusing efforts towards shared priorities across biosecurity sectors and encouraging collaboration, knowledge sharing and mentoring.

Historically in Australia, environmental biosecurity was viewed as the 'poor cousin' of biosecurity compared to animal health and plant health. The National (Australian) Environment and Community Biosecurity RD&E Strategy (NECBRDES) 2021-26, is one initiative to address this by:

- better linking biodiversity and biosecurity research and policy
- identifying priorities and building and maintaining capability
- promoting RD&E priorities for investment
- working collaboratively across other national biosecurity RD&E strategies to identify shared priorities and opportunities, and
- encouraging international partnerships and opportunities

This poster will detail NECBRDES 2021-26 and other recent initiatives such as the establishment of the Environmental Biosecurity Office, the formation of the Environmental Invasives Committee and the release of the National Biosecurity Strategy. These initiatives are ensuring equal weight is given to the protection of environment and the economy from biosecurity threats. The poster will outline opportunities for international collaborations in environmental biosecurity.

Keywords: Environmental biosecurity RD&E, collaborations, Strategy

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Thermal requirements of native and alien plant species in cold environments.

Hana Skalova[4], Lenka Moravcova[1], Jan Pergl[1], Petr Pysek[1,2], Anna Lucanova[1], Josef Kutlvasr[1,3], Michaela Vitkova[1]

(1) Institute of Botany, The Czech Academy of Sciences, Zamek, Pruhonice, Czech Republic
(2) Department of Ecology, Faculty of Science, Charles University, Vinicna, Praha, Czech Republic
(3) Faculty of Environmental Science, Czech University of Life Science Prague, Kamýcká 129, Praha Czech Republic
(4) Without Affiliation
*Corresponding author: hana.skalova@ibot.cas.cz

Cold environments (high-elevation regions and polar zones) are disproportionately strongly affected by global change. Increasing temperatures and prolonged vegetation season in these regions support the spread of many native species towards high altitudes, and also naturalization of aliens transported along roads from the foothills. To obtain insight into the role of a key traits determining these processes, we compared the thermal requirements of these species. We collected seeds of 16 common species along elevation gradients from ~50 sites spread across the globe where these species occur as native or alien depending on geographic location. Seeds were weighted and tested for germination and seedling growth under nutrient supply corresponding to cold-environment soils and four temperature regimes simulating current and predicted future conditions. We investigated seed weight, germination, viability, and germination dynamics (T50, i.e., the time when 50% of germinable seeds germinated) during a five-week trial and a number of seedling characteristics after four-week cultivation. The preliminary results show that the total germination, seedling biomass and height, and number of leaves and inflorescences increased with increasing temperatures, while T50 decreased, and seed viability was unaffected. The differences among individual populations will be analysed in relation to their geographical origin, native/alien status, temperatures, and environmental factors at the original sites.

Keywords: plant invasion, population, seeds.

Fire and plants: Role of vegetation flammability in wildfire risk in wildland-urban interface zones of south-central Chile.

O. Toy-Opazo[1,2,3], V. Palma[1]., A. Fuentes-Ramírez[1,2], A. Fuentes-Castillo[4], R. Demarco[4]

(1) Laboratorio de Ecosistemas y Bosques (EcoBos), Departamento de Ciencias Forestales, Facultad de Ciencias Agropecuarias y Medioambiente, Universidad de la Frontera, Temuco, Chile.
(2) Centro Nacional de Excelencia para la Industria de la Madera (CENAMAD). Pontificia Universidad Católica de Chile, Santiago, Chile.
(3) Programa de Magíster en Manejo de Recursos Naturales, Facultad de Ciencias Agropecuarias y Medioambiente, Universidad de la Frontera, Temuco, Chile.
(4) Departamento de Industrias, Universidad Técnica Federico Santa María, Valparaíso, Chile.

In recent decades, forest fires have become an increasingly frequent and severe disturbance worldwide, generating serious ecological and economic consequences. In Chile, there has been a significant increase in the magnitude and extent of these fires in the last 20 years. Although there are multiple variables that influence the behavior of forest fires, the importance of the flammability of vegetation has historically been underestimated, but is only now being considered as a relevant factor in fire risk. Therefore, knowing the flammability of both native and non-native vegetation is a valuable approach to advance in better forest fire prevention and management practices. The main objective of this research is to evaluate the flammability of both native and non-native plant species coexisting in wildland-urban interface zones [WUI] in La Araucanía. An integrated flammability method (MIIN) will be used, which employs a piloted ignition to evaluate ignition, consumability, sustainability and combustibility parameters. These data will be used to rank the results and generate a flammability index for the vegetation.

It is expected to observe differences in the flammability characteristics of the species studied, mainly when comparing native vs. non-native, and that such variability could also be explained by variables of humidity, morphology and calorific value of the vegetation. The results obtained will be useful for better planning to help prevent the spread of forest fires with a specific focus on the species used for forestation in the WUI. This research also highlights the importance of improving forest fire management and prevention practices in Chile, thus contributing to minimize the risk of forest fires and protect both people's lives and natural resources.

Keywords: Flammability; WUI zones; Native; Non-Native; Management

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The large Gunnera's (*G. tinctoria* and *G. manicata*) in Europe in relation to EU regulation.

Johan Van Valkenburg[1], Bruce Osborne[2]

(1) NVWA, Netherlands Institute for Vectors, Invasive plants and Plant health,, Wageningen, the Netherlands
(2) University College Dublin, UCD School of Agriculture and Food Science, UCD Earth Institute, Dublin, Ireland

In the horticultural trade *Gunnera* plants are generally of modest dimensions and rarely flowering, so that the major distinguishing morphological characters for the identification of the two large species, *G. tinctoria* and *G. manicata*, are missing. As *G. tinctoria* is included in the EU regulation, its trade is prohibited, although the closely related species, *G. manicata* is not included on the list. Given that it is often difficult to distinguish between these two large herbaceous species using morphological attributes we used standard chloroplast DNA barcode markers, supplemented at a later stage by ITS markers. Plant material of putative *G. tinctoria* or *G. manicata* was obtained from the native and introduced range, both from "wild" sources, botanical gardens, and the horticultural trade. In western Europe plants circulating in the horticultural trade turned out to be predominantly *G. tinctoria,* with only one plant in cultivation identified as true *G. manicata* and the *G. manicata* found in botanical gardens was a hybrid recently described as G. x cryptica. Further fieldwork in the native range of both species is highly desirable to corroborate the findings in western Europe.

Keywords: Gunnera, barcoding, EU regulation 1143/2014

Species with invasive behavior in coastal sand dunes: Comparison of the effects of a native and a non-native species on soil carbon and nitrogen in sand dunes in southern Chile.

Liliana Vásquez-García[1,2,] Bruce Arthur Osborne[3], Jorge Pérez-Quezada[1,2]

(1) Laboratorio de Ecología de Ecosistemas, Facultad de ciencias agronómicas, Universidad de Chile – Santiago de Chile.
(2) Instituto de Ecología y Biodiversidad –Chile.
(3) School of Agriculture and Food Science, Science Center, University College Dublin, Ireland.

Sand dunes in coastal areas are very important habitats for specialist species. Besides the extreme environmental conditions in these ecosystems, native and non-native species with invasive behavior often stablish in these poorly cover soil. In coastal sand dunes in southern Chile, the colonization of the native Gunnera tinctoria (GT) and the invasion of the non-native Ulex europaeus (UE), both N-fixing species, formed large and dense patches accumulating substantial amounts of above and belowground biomass. Consequently, nutrient enrichment and changes in soil stocks were expected. This study compared the effects of the establishment of the two above mentioned species in the soil carbon (C) and nitrogen (N).

Results showed that C stocks increase under both colonizer and invasive species, and the main accumulation was observed at first 10 cm of soil top layer. Notwithstanding, GT accumulates significatively more C than UE (27.8 and 18.2 Mg ha-1 respectively), in comparison to 8.7 Mg ha-1 of the resident plant communities of dunes.

Contrary to expectations, this study did not find a significant increase in the N soil stock (0.7 Tn ha-1) due to UE invasion, but a significant reduction of N plant available (~17 mg kg-1) was found under these patches. Meanwhile, GT colonization showed a significant increase in N concentration (~25 mg kg-1) and soil stock (1.1 Mg ha-1) compared to UE invasion and resident dune plant communities (~19 mg kg-1 and 0.4 Mg ha-1, respectively).

It is concluded that species with invasive behavior changes nutrient availability in sand dunes, showing potentially negative effects for the conservation of specialist species.

Functional trait variation of Ulex europaeus along mountain altitudinal gradients in Colombian high mountains.

Maribel Y. Vásquez Valderrama[1,2,3]

(1) Laboratorio de Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Universidad de Concepción, Concepción, Chile
(2) Instituto de Ecología y Biodiversidad (IEB), Santiago, Chile
(3) Jardín Botánico de Bogotá José Celestino Mutis, Bogotá, Colombia

Biological invasions are considered one of the main drivers of change in natural ecosystems. Invasive species can vary functional traits along environmental gradients in response to different biotic stressors being strong competitors in novel distribution areas. In this study, we evaluated how *Ulex europaeus*, an aggressive invasive plant species worldwide, varies its functional traits along altitudinal gradients of Colombian high mountains as an adaptative strategy to invade. We collected and measured along an altitudinal gradient from 2600 to 3500 m above sea level, 15 functional traits related to stability (roots and wood traits), tissue investments (leaf traits), and dispersal processes for individuals of *U. europaeus*. Our results showed that leaf traits (except for leaf thickness) and wood-root traits were generally unrelated to altitude. In contrast, the dispersal traits (fruit and seed mass, specific density, and length) were positively associated with variations in altitude. Here, the seed diameter and length increased as the altitude raised. In this sense, the variation in seed traits allows *U. europaeus* to expand beyond its current distribution limits. Additionally, this species experienced a trade-off between stability and investment of tissues to perform well along the entire altitude gradient. Thus, intraspecific variation in functional traits can help us to model sensitive areas for invasion along altitudinal gradients and provide management tools to face biological plant invasions.

Keywords: invasive plants species, seed traits, altitudinal gradients
Financing: Fondecyt 1180205 and ANID/BASAL FB210006

A unified database of alien plants for Europe: Example of mapping biogeographical and ecological patterns of plant invasions on a continental scale.

Martin Večeřa[1], Veronika Kalusová[1], Milan Chytrý[1], Jan Divíšek[1,2], Natálie Čeplová[1,3], Jiří Danihelka[1], Petr Pyšek[4,5], Irena Axmanová[1]

(1) Masaryk University, Department of Botany and Zoology, Faculty of Science, Kotlářská 2, CZ-611 37, Brno, Czech Republic
(2) Masaryk University, Department of Geography, Faculty of Science, Kotlářská 2, CZ-61137, Brno, Czech Republic
(3) Masaryk University, Department of Biology, Faculty of Education, Poříčí 7, CZ-60300, Brno, Czech Republic
(4) Czech Academy of Sciences, Department of Invasion Ecology, Institute of Botany, Zámek 1, CZ-25243, Průhonice, Czech Republic
(5) Charles University, Department of Ecology, Faculty of Science, Viničná 7, CZ-12844, Praha, Czech Republic

Europe is among the most extensively surveyed regions in terms of alien plant invasions. However, the completeness and quality of information varies among regions, and existing databases suffer from overall lack of consistency. This makes pan-European assessments difficult. Research has shown that the invasion levels and impact of invasions on native species depend especially on region and habitat type, but are consistent within particular habitats across regions. Therefore, it is essential to have a unified framework for efficient monitoring of alien plants and research of factors contributing their spread in specific habitats across Europe. Such a framework would also be important for guiding efforts to mitigate negative impacts on biodiversity, especially with respect to ongoing environmental changes.

We compiled alien plant inventories, checklists, existing databases and scientific literature for 55 European countries or regions and started to refine and gap-fill national lists of alien plants and related information. We harmonized species nomenclature, standardized data on residence time, invasion status and region of origin, and consulted regional experts to resolve conflicting status assignments. This data will be made freely available and regularly updated in the FloraVeg.EU database. Further, we combined this data with vegetation plots covering most of Europe to explore and understand biogeographical and ecological patterns of neophyte invasions in a wide range of habitats. We corrected for spatial bias caused by uneven sampling density, calculated different metrics of invasion levels both for species pools and individual communities, mapped these patterns and analyzed relationships with broad-scale environmental and anthropogenic factors.

Keywords: Database, Europe, Plant invasion

How many seedlings of Pinus radiata are needed to invade native forests in central Chile?

Constanza Vera[1,2], Alvaro G. Gutierrez[1,2]

(1) Universidad de Chile, Departamento de Ciencias Ambientales y Recursos Naturales Renovables, Facultad de Ciencias Agronomicas, Santa Rosa 11315, La Pintana, Santiago, Chile
(2) Instituto de Ecología y Biodiversidad

The winter-deciduous warm temperate forest, found in the coast of central Chile, is an ecosystem of global importance for biodiversity conservation due to its endemic species, high degree of human intervention, and the increasing drought conditions resulting from climate change. Currently, these forests are only found in remnant patches because it has been replaced by other land uses, mainly monocultures of the exotic tree species such as Pinus radiata. Due to the invasive potential of this species, it is necessary to anticipate how invasive can be P. radiata under climate change and potential disturbances (e.g., logging and forest fires) affecting the native forest. We hypothesize that the degree of P. radiata invasion and subsequent persistence in the succession will be greater in those native forests that have been subjected to more recurrent forest fires or disturbances (e.g. selective logging). We explored this hypothesis using a successional dynamics model to predict forest structure in the Cauquenes river watershed (36ºS, Chile), under a pessimistic climate change scenario (SSP370). We explored different scenarios of P. radiata invasion in a stand dominated by natives and a mixed stand. Future projections of forest succession by the end of the century showed that P. radiata does not compete with native species, under a scenario without considering disturbances and any additional input of P. radiata's recruitment. We will discuss what levels of invasion (i.e. number of recruits) would lead to a dominance of P. radiata in native forest fragments.

Keywords: Nothofagus, Mediterranean-type forests, forest gap model

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European synthesis of alien Robinia pseudoacacia-dominated vegetation types.

Michaela Vitkova[1], Jiri Sádlo[1], Jan Rolecek[1,2], Maria Sibikova[3], Radoslav Puchałka[4,5], Vasyl Budzhak[6], Anikó Csecserits[7], János Csiky[8], Tetiana Dziuba[9], Franz Essl[10], Michael Glaser[10], Jana Medvecká[3], Momchil Nazarov[11], Tamás Rédei[7], Tommaso Sitzia[12], Denisa Slabejová[3], Kiril Vassilev[11], Petr Pyšek[1,13], Ivan Jarolimek[3]

(1) Institute of Botany, Czech Academy of Sciences, Department of Invasion Ecology, Zamek 1, Pruhonice, Czech Republic
(2) Masaryk University, Department of Botany and Zoology, Faculty of Science, Brno, Czech Republic
(3) Institute of Botany, Slovak Academy of Sciences, Plant Science and Biodiversity Centre, Bratislava, Slovakia
(4) Nicolaus Copernicus University, Department of Ecology and Biogeography, Toruń, Poland
(5) Nicolaus Copernicus University, Centre for Climate Change Research, Toruń, Poland
(6) National Academy of Sciences of Ukraine, Institute for Evolutionary Ecology, Kyiv, Ukraine
(7) Institute of Ecology and Botany, Centre for Ecological Research, Vácrátót, Hungary
(8) Institute of Biology, University of Pécs, Department of Ecology, Faculty of Sciences, Pécs, Hungary
(9) National Academy of Sciences of Ukraine, M.G. Kholodny Institute of Botany, Kyiv, Ukraine
(10) University of Vienna, BioInvasions. Global Change. Macroecology Group, Department of Botany and Biodiversity Research, Vienna, Austria
(11) Bulgarian Academy of Sciences, Institute of Biodiversity and Ecosystem Research, Sofia, Bulgaria
(12) University of Padova, Department of Land, Environment, Agriculture and Forestry, Legnaro, Italy
(13) Charles University, Department of Ecology, Faculty of Science, Prague, Czech Republic

North American tree black locust (*Robinia pseudoacacia*) has invaded a wide range of European habitats, from urban and agricultural to forests and natural grasslands where it outcompetes native plants and changes the community in favour of ruderals, aliens, and generalists at the expense of habitat specialists. We collected data from ~6,500 plots with *Robinia pseudoacacia* across Europe that were sampled using phytosociological methods. The final dataset meeting our criteria for analysis consisted of 2,325 relevés from 20 countries and included 1,336 plant species. Numerical classification, reflecting the main gradients in species composition, divided the European *Robinia* stands in a hierarchical tree into three clusters at the highest level (phytosociological alliances) and into 10 clusters (associations) at the lowest level. The first alliance is non-ruderal, characterized by ferns and nemoral forest herbs, distributed mainly in the oceanic climate in Western Europe. A high proportion of light demanding species and graminoids dominating in the understorey are typical features of the second alliance occurring mainly in Central, Eastern, and South-Eastern Europe. One of the associations belonging to this alliance represents dwarf *Robinia* stands resulting from the spread of this alien into thermophilous grasslands, a habitat most endangered by the *Robinia* invasion in Europe. The last alliance includes typical *Robinia* forests distributed all over Europe with dominating ruderal nitrophilous species and woodland generalists. Our results contribute to understanding the causes of variable species composition of *Robinia* stands and can serve as a basis for a science-based management strategy reflecting a site-specific approach.

Keywords: Black locust, classification, invasiveness

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SEED-ASICS: A new global network for monitoring plant invasions in cold environments as a result of global changes.

Michaela Vítková[1], Josef Kutlvašr[1,2], Lenka Moravcová[1], Irena Perglová[1], Jiří Sádlo[1], Hana Skálová[1], Petr Pyšek[1,3], Jan Pergl[1] and SEED-ASICS partners

(1) Institute of Botany CAS, Průhonice, Czech Republic, michaela.vitkova@ibot.cas.cz
(2) Faculty of Environmental Sciences CULS, Praha, Czech Republic
(3) Faculty of Science, Charles University, Prague, Czech Republic

Anthropogenic factors such as climate change and biological invasions increasingly threaten cold environments and their endemic diversity. Within the BiodivERsA project ASICS (ASsessing and mitigating the effects of climate change and biological Invasions on the spatial redistribution of biodiversity in Cold environmentS; https://www.coldregioninvasives.com), we established a global network covering 48 regions worldwide, both islands and inland, ranging from the Arctic to high mountains on all continents to Antarctica. We focus on predictions of biological invasions under future human pressure and climatic and land-use changes to develop sound mitigation and management measures in these areas. This will be achieved by studying distributional shifts of selected spreading alien and expanding native plant species along altitudinal and latitudinal gradients, their tolerance limits, and ecological niches in a changing environment. To explore the patterns in soil temperatures and humidity over years and soil nutrient availability over vegetation season in connection with vegetation changes, paired plots (roadside and pristine) along one road or hiking trail leading across the elevation gradient were established at three altitudes within each region. To identify plant species that are a potential threat to highly vulnerable cold ecosystems, we selected a subset of 16 commonly occurring alien and native expansive vascular plants to detect their thermal requirements and plasticity. As the invasions and climate are changing over the years and single measurements are not sufficient, the aim is to keep the monitoring of the sites over a long-term horizon.

Keywords: Arctic and alpine tundra, distributional shifts, global research collaboration

Growing in the rain: the effect of nitrogen atmospheric deposition on invasive plants in different habitats.

Martin Vojík[1], Tomáš Görner[1], Jonáš Gaigr[1], Martina Kadlecová[3], Tomáš Chuman[2], Karel Chobot[1]

(1) Nature Conservation Agency of the Czech Republic, Kaplanova 1, CZ-148 00, Prague 4, Czech Republic
(2) Czech Geological Survey, Klárov 3, 118 00, Prague, Czech Republic
(3) Czech University of Life Sciences Prague, Faculty of Environmental Sciences, Kamýcká 129, 165 00, Prague 6, Czech Republic

The atmospheric nitrogen input represents one of the major threats to a range of habitats by increasing the risk of their invasibility. This can alter the community composition and lead to a degradation of habitats. Moreover, the invasive species of plants can be more competitive than indigenous species in nitrogen-saturated sites and can replace them. This indicates that suitable habitats with high nitrogen input can represent the invasion hotspots to protected areas or open landscape. Identifying these hotspots can be crucial for efficient control planning and prioritisation of eradication. Using the data on habitat and invasive plant species occurrence and predicted atmospheric nitrogen deposition data, we analysed the presence of invasive species in selected forest habitats across the nitrogen input gradient. The analyses of the robust dataset (more than 20,000 records) revealed significant relationships between nitrogen input, habitat types, and occurrences of invasive species. The differences in the presence of invasive plant species were significant in response to the predicted nitrogen input across various habitat types in the Czech Republic. Alluvial forests represent a frequently invaded habitat type on a global level; it was shown that there is also a significant relationship with nitrogen input.

Our results provide important materials for setting future control of IAS, aiming to counter the negative impacts of nitrogen input in combination with invasive spreading by identifying high-risk areas. A large-scale model of atmospheric input could therefore serve as a suitable tool for explaining current invasive spread and predicting potential spread in the future.

Keywords: alien plants, natural habitats, nitrogen deposition

Better to be naïve: Eco-evolutionary experience better explains invasion success of Senecio inaequidens than soil conditions.

Florencia A. Yannelli[1,2], Lara Quaglini[3], Isabella Gandolfi[3], Andrea Franzetti[3], Sarah Caronni[3], Chiara Montagnani[3], Clinton Carbutt[4], Jonathan M. Jeschke[1,2], Sandra Citterio[3], Rodolfo Gentili[3]

(1) Freie Universität Berlin, Berlin, Germany
(2) Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin, Germany
(3) Università degli Studi di Milano-Bicocca, Milano, Italy
(4) University of KwaZulu-Natal, Scottsville, South Africa
*Corresponding author: florenciayannelli@gmail.com

The underlying mechanisms explaining plant invasion success are frequently described to be context-dependent. In this study, we seek to understand the role that eco-evolutionary experience, phylogenetic similarity and interactions with soil microbial communities play in modulating competition and the success of the invasiveSenecio inaequidens DC. To this end, we carried out a fully factorial experiment in growth chambers consisting of two factors: competing community identity with three levels (species from the native range (South Africa), from the invasive range (Italy) and a control with only Senecio) and soil biota conditions with two levels (microbial colonized soil and autoclaved soil). We found the competing community identity to have the most significant effect on Senecio's performance (height and lateral growth), with overall smaller plants when competing with species native to South Africa. When comparing the effect of phylogenetic similarity between the invasive and native communities on Senecio, our data showed that high similarity with the most abundant native species in the community resulted in smaller invasive plants. Soil sterilization had a significant effect on the soil bacteria community structure, especially in the control, which had a significant lower diversity and differed in their structure to the other treatment combinations. However, the opposite was found in treatments containing native species. Hence, our results indicate that Senecio inaequidens has a better performance in naïve communities and seems to select for certain soil bacteria that may favor its performance more efficiently than when growing alone.

Keywords: plant-soil feedbacks, limiting similarity, soil bacteria.

Douglas fir in Germany and Chile - A potential threat for natural communities across continents?

Jan Zäh[1], Steffi Heinrichs[1], Aníbal Pauchard Cortés[4], Jonas Glatthorn[2], Sabine Müller-Using Wenzke[3]

(1) Georg-August-Universität Göttingen, Silviculture and Forest Ecology of the Temperate Zone, Göttingen, Germany
(2) Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland
(3) Instituto Forestal, Valdivia, Chile
(4) Universidad de Concepción, Laboratorio de Invasiones Biológicas (LIB), Facultad de Ciencias Forestales, Concepción, Chile

The promotion of non-native tree (NNT) species to integrate both productivity and stability in forest ecosystems is a prominent silvicultural tool in Central Europe considering the adaptation of forests to climate change. However, the cultivation of NNTs is also seen critical as it is difficult to predict how forest ecosystems are altered by an alien species or how surrounding ecosystems will be impacted.

A NNT species introduced in many different parts of the world, including Germany and Chile, due to its outstanding growth performance and high timber quality is Douglas fir (*Pseudotsuga menziesii*), native of North America. Its planted area is currently growing in Germany as it is also considered drought tolerant, while the invasive potential into native forests is rated as low. In some regions of Chile, though, a spread of Douglas into native forests was observed. To reveal potential reasons for differences in the invasion potential, we studied mechanistic drivers of invasion in different environmental settings in Germany and Chile.

Starting within three pure Douglas fir stands in northern Germany and five in south-central Chile, we established in total 20 systematic transects up to 100 m distance from the stand edges. We recorded the presence of Douglas fir and other tree species saplings, as well as further abiotic and biotic factors. Preliminary results reveal that the spread of Douglas fir is largely controlled by canopy cover (LAI), distance to seed trees and understory cover.

Results will contribute to management implications to prevent a further spread into native ecosystems.

Keywords: drivers of invasion, non-native tree species, transcontinental

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