NEOBIOTA 2024 BOOK OF ABSTRACTS

13TH INTERNATIONAL CONFERENCE ON BIOLOGICAL INVASIONS

3RD-6TH SEPTEMBER 2024

LISBON
PORTUGAL

MARE

Ciências ULisboa

UNIVERSIDADE DE ÉVORA

Neobiota 2024 Book of Abstracts

Publisher:
Universidade de Évora

Edition, Coordination and Revision:
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Design:
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1st edition: September 2024

ISBN:
978-972-778-416-5

This abstract book was compiled and edited by Pedro Anastácio, Pedro Brandão, Paula Chainho, Helena Trindade and Filipe Ribeiro. We thank all the authors for their contributions and the Abstract reviewers from the scientific and organizing committees for their invaluable feedback.

To cite this abstract book:
Anastácio, P., Brandão, P., Chainho, P., Trindade, H. & Ribeiro, F. (Eds.). (2024). *Neobiota 2024 Book of Abstracts*. MARE – Marine and Environmental Research Centre, Faculty of Sciencies of the University of Lisbon and University of Évora.

To cite an individual abstract:
[Author(s)]. 2024. [Title of the Abstract]. In: Neobiota 2024 Book of Abstracts. Anastácio, P., Brandão, P., Chainho, P., Trindade, H. & Ribeiro, F. (Eds.). [page numbers]. 3-6 September. Lisbon, Portugal.

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THE NEOBIOTA ASSOCIATION

NEOBIOTA is an international scientific organization dedicated to the study of biological invasions. It promotes collaboration among researchers, policymakers, and practitioners to understand and mitigate the impacts of invasive species on biodiversity, ecosystems, and human well-being

NEOBIOTA

President: Montserrat Vilà, elected President of NEOBIOTA in 2014, during the meeting in Antalya, and re-elected during the Dun Laughaire meeting in 2018. She has been Vice President from 2012 to 2014.

Vice President: Franz Essl, elected Vice President of NEOBIOTA in 2014, during the meeting in Antalya, and re-elected during the Dun Laughaire meeting in 2018.

Secretary: Ana Novoa, elected Secretary of NEOBIOTA in 2022, during the meeting in Tartu.

Honorary President: Ingo Kowarik, co-ordinating NEOBIOTA from 1999 to 2014 and elected President in 2012, during the meeting in Pontevedra, and Honorary President in 2014, during the meeting in Antalya.

NEOBIOTA BOARD

The NEOBIOTA Board includes 10 experts from Europe. The main tasks are:

- Represent NEOBIOTA and enhance communication and research at the European level
- Decide on the future development of NEOBIOTA and on the venue of the NEOBIOTA conferences
- Elect the President, Vice President and Secretary of NEOBIOTA

MEMBERS OF THE NEOBIOTA BOARD:

Sven Bacher, Giuseppe Brundu, Franz Essl, Piero Genovesi, Ingo Kowarik – Honorary President, Ingolf Kühn, Bruce Osborne, Petr Pyšek, Helen Roy, Montserrat Vilà.

WELCOME MESSAGE

Dear Participants,

We are thrilled to welcome you to the Neobiota 2024 Conference in the beautiful city of Lisbon. Over the next week, you will experience a series of engaging sessions, insightful discussions, and valuable networking opportunities, all centered around the dynamic field of biological invasions.

This year's conference promises to be exceptional, featuring a diverse range of topics that reflect the latest research and developments in the study of biological invasions. We are honored to have your participation, which significantly contributes to the success and richness of this event.

The Neobiota 2024 Conference is a collaborative effort spearheaded by the MARE – Marine and Environmental Research Centre, in conjunction with the Faculty of Sciences of the University of Lisbon and the University of Évora. As leaders of the Biological Invasions group at MARE, we have risen to the challenge of organizing this significant event.

The importance of studying biological invasions has grown tremendously, both in scientific circles and among the general public. It is now widely recognized as a critical environmental issue that demands our attention and action. We are delighted to report that the number of participants at Neobiota 2024 has far exceeded our expectations, with over 460 attendees from 50 countries around the globe. This remarkable turnout underscores the global relevance and urgent nature of our work. Additionally, the enthusiasm of the invasion science community is evident in the proposal of eight pre-conference workshops, highlighting the dynamism and proactive nature of our field.

For the first time in the history of Neobiota conferences, we have introduced parallel sessions instead of a single, unified session. While this decision sparked diverse opinions within the scientific committee, it was necessary to accommodate a larger number of oral presentations. Although some interactions and information sharing may be segmented, this format allows us to showcase a greater variety of research.

We hope you find the sessions stimulating, the discussions enriching, and the networking opportunities fruitful. Enjoy the conference and your stay in Lisbon. Let's make Neobiota 2024 a memorable and impactful event.

Warm regards,

Pedro Anastácio, Paula Chainho and Filipe Ribeiro

SUSTAINABLE PRACTICES AT NEOBIOTA: REDUCING OUR ENVIRONMENTAL FOOTPRINT

To minimize the environmental impact of the NEOBIOTA conference, we have implemented several eco-friendly initiatives. We have chosen catering service providers that do not use disposable tableware, ensuring all serving materials are reusable. In addition, we have contracted companies with well-defined environmental policies, and the menus have been carefully selected to include more sustainable products.

To further promote sustainability, we have encouraged the use of public transportation for participants, and we have decided not to offer conference swag. Instead, we will provide water stations on-site to reduce the need for single-use plastic bottles.

In our effort to reduce paper usage, we are offering an e-book of abstracts, using QR codes for identification at the dinner and for accessing the conference program. We have also asked participants to bring their own lanyards for their badges, and we will have a selection of reusable lanyards available.

The conference badges are printed on paper made from sugarcane waste, and the signage placards are made from recyclable materials like hexaboard and sugarcane-based paper. These steps are part of our commitment to reducing the ecological footprint of the conference and promoting sustainable practices.

HOST INSTITUTIONS

MARE - MARINE AND ENVIRONMENTAL RESEARCH CENTRE

MARE is a center for scientific research, technological development and innovation, oriented to societal challenges. With technical and scientific skills to address all aquatic ecosystems, including river basins and adjacent areas, estuaries, coastal and oceanic marine ecosystems, MARE adopts an integrative and holistic approach, in close partnership with national and international institutions.

MARE is a multi-institutional centre, created in January 2015, with a nationwide territorial implantation in Portugal. It is located in eight Regional Research Units, at higher education campus in Portuguese mainland, respectively University of Coimbra (MARE-UCoimbra), Polytechnic of Leiria (MARE-PLeiria), University of Lisbon (MARE-ULisboa), NOVA University of Lisbon (MARE-NOVA), ISPA (MARE-ISPA), Instituto Politécnico de Setúbal (MARE-IPSetúbal), University of Évora (MARE-UÉvora), and ARDITI/University of Madeira (MARE-Madeira).

https://www.mare-centre.pt/en

MARE - Marine and Environmental Sciences Center is supported by Fundação para a Ciência e Tecnologia (FCT) through the projects UIDB/04292/2020 and UIDP/04292/2020 and through project LA/P/0069/2020, for the Associate Laboratory ARNET.

FACULTY OF SCIENCES OF THE UNIVERSITY OF LISBON

The Faculty of Sciences of the University of Lisbon (Ciências ULisboa) is a prestigious institution within the Portuguese higher education system, dedicated to advancing knowledge through cutting-edge research and comprehensive academic programs. With a focus on scientific excellence, Ciências ULisboa offers a diverse array of undergraduate, master's, and doctoral courses, alongside specialized training and lifelong learning opportunities. The faculty's commitment to academic rigor and innovation equips students and professionals with the skills needed to address complex scientific and societal challenges.

Ciências ULisboa is deeply integrated into the Lisbon region, leveraging its strategic location to foster collaborations with national and international research institutions, industries, and community organizations. The faculty emphasizes sustainability, technological advancement, and societal impact, aligning its efforts with global scientific and environmental goals. Core values such as academic freedom, scientific integrity, and inclusivity guide its mission to produce impactful research and educated citizens prepared for a rapidly changing world. Key strategic areas include Fundamental and Applied Sciences, Environmental and Earth Sciences, Biological Sciences, Information Technology and Computing, and interdisciplinary initiatives aimed at addressing contemporary global issues.

https://ciencias.ulisboa.pt/en

UNIVERSITY OF ÉVORA

The University of Évora, a key institution in the Portuguese public higher education system, is dedicated to the production, socialization, and transmission of knowledge. Through its scientific and artistic research, the university fosters technological and humanistic development. It offers a wide range of academic qualifications, including undergraduate, master's, and doctoral courses, alongside lifelong learning opportunities for both traditional students and working professionals. Additionally, the University of Évora plays a pivotal role in community engagement, driving innovation, business competitiveness, modernization of public services, and overall social and cultural development.

Rooted in the Alentejo region, the University of Évora prioritizes regional development while embracing European Community values and fostering strategic alliances with neighboring regions. Its vision extends to Portuguese-speaking countries, preparing students for global challenges. Upholding the principle of free inquiry as articulated by Henri Poincaré, the university values human dignity, academic freedom, individual merit, rigorous execution of tasks, democratic decision-making, and non-discrimination. Its strategic development areas include Agricultural Sciences and Technologies, Environment, Spatial Planning and Renewable Energies, Heritage, Tourism and the Arts, Digitalization and Data Science, Aerospace, and Health and Well-being.

https://www.uevora.pt/en

PRACTICAL INFORMATION ABOUT PORTUGAL

Banking:
ATMs are widely available, and major credit cards are accepted in most establishments.

Recommended Clothing in September:
Lightweight clothing is recommended as temperatures can be warm, but evenings may be cooler so a light jacket is advisable.

Electricity and Plug Types:
Portugal uses type C and F plugs with a standard voltage of 230 V and frequency of 50 Hz.

Emergency Contacts:
General Emergency: 112

International Phone Code:
+351

Transportation:
Taxi / Uber / Other: Taxis and Uber are readily available.
Buses and Metro: Extensive bus network covering all major areas. Metro is available in Lisbon.
Railway: Regular train services connect Lisbon with other regions of Portugal.

Shopping:
Shops are typically open from 9:00 AM to 7:00 PM, with some larger stores staying open later.

Tipping:
Tipping is not obligatory but appreciated; around 5-10% of the bill is customary in restaurants.

GENERAL CONFERENCE INFORMATION

Date and Venue:

3-6 September 2024,
Faculty of Sciences, University of Lisbon,
C3 and C6 buildings.

Workshops: C6 and C3 Buildings
Main Sessions: C3 Building.
Pleanary talks: Room B.
Welcome reception: C6 Building.
Secretariat: C3 building during September 3 and C6 Building 4-6 September
Coffee Breaks: C3 Building
Poster Sessions: C6 Building
Lunch: C6 Building
Conference dinner: Academy of Sciences – Rua da Academia das Ciências, number 19

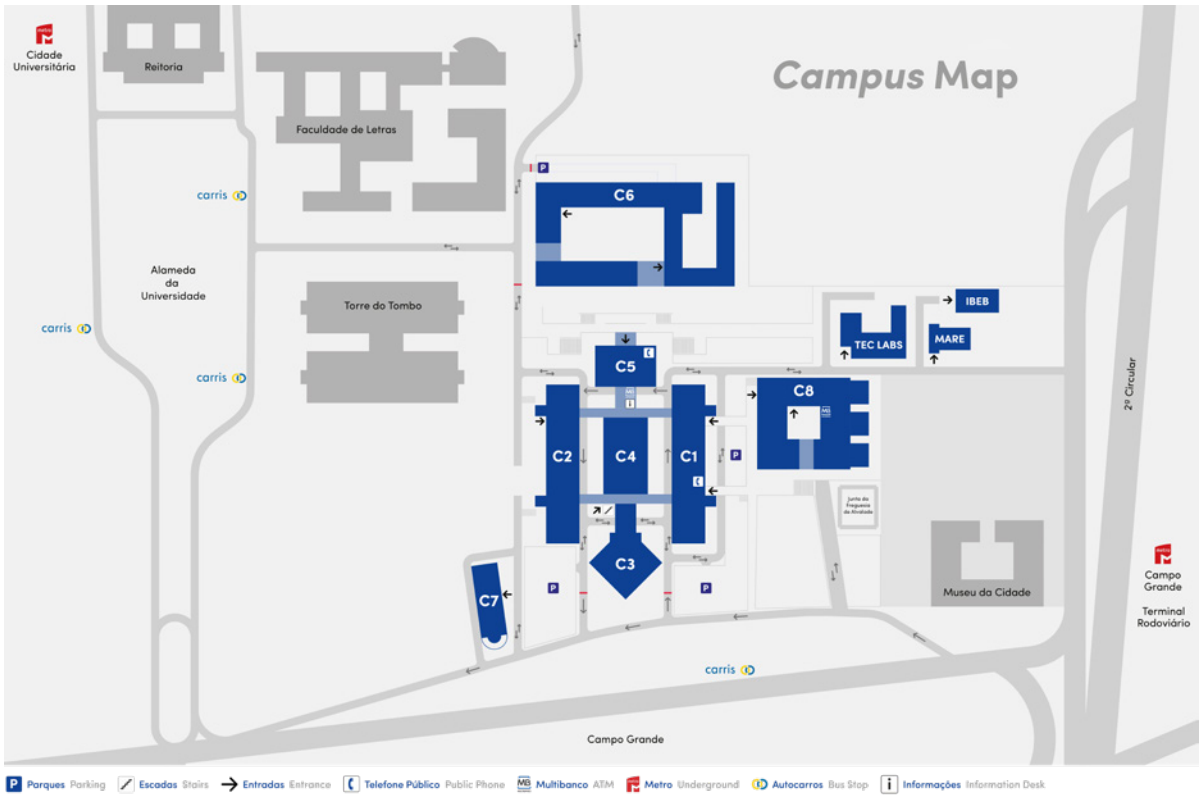
Registration Desk Hours:

Workshops Day: September 3, from 9:00 to 18:00
Main Conference Days: September 4-7, from 8:00 to 18:30

Name Badge:

Always wear your badge. Bringing your own badge holding strap is recommended to avoid waste.

FACULTY OF SCIENCES CAMPUS MAP (IN BLUE):



HOW TO GET TO THE CONFERENCE:

To get from Lisbon Airport to the C3 building of the Faculty of Sciences at the University of Lisbon, there are several convenient transportation options:

By Metro (Subway)

You can use this planner: https://www.metrolisboa.pt/en/travel/plan_a_journey/

1. From the Airport: take the Red Line (Linha Vermelha) from the Aeroporto station.
2. Transfer at Saldanha: change to the Yellow Line (Linha Amarela) at the Saldanha station.
3. Get off at Campo Grande: exit the train at the Campo Grande. This station is close to the C3 building at the university campus.
4. Walk to the C3 Building: from the Campo Grande, it's about a 10-minute walk to the C3 building.

By Bus

You can use this planner: https://www.carris.pt/en/travel/planear-viagem/

1. From the Airport: take the Bus 744 and 783 from the Aeroporto bus stop.
2. Get off at Campo Grande: exit the bus at the Campo Grande stop.
3. Transfer to a Bus or Walk: from Campo Grande, you can either walk (approximately 15 minutes) or take a short bus ride using local routes like Bus 731 or 735 that stop closer to the university.

By Taxi or Uber

1. Taxi Stand: taxis are available outside the arrivals terminal. The journey to the university takes about 15-20 minutes, depending on traffic, and costs approximately 10-15 euros.
2. Uber: request an Uber from the airport. The cost and time are similar to a taxi. Note that Uber and other similar services cannot pick passengers at the taxi area within the arrivals section of the airport.

By Car

1. Rental Car:
   - If you got a rental car at the airport, exit the airport and follow signs for the city center.
   - Take Av. Almirante Gago Coutinho and follow signs to 2ª Circular towards Campo Grande.
   - Take the exit towards Cidade Universitária and follow signs to the university campus.
2. Parking: note that university private parking is not available for conference attendees. However, several paid parking areas are nearby.

Directions Summary:

Metro: Red Line to Saldanha ⟶ Yellow Line to Campo Grande ⟶ Walk.
Bus: Bus 744 or 783 to Campo Grande ⟶ Walk or local bus.
Taxi/Uber: Direct to the university.
Car: Follow signs to Cidade Universitária ⟶ Nearby paid parking.
This guidance ensures you reach the C3 building conveniently from Lisbon Airport, regardless of your preferred mode of transport.
Parking: University private parking is not available for attendees. Nearby paid parking areas are accessible.

ADDITIONAL INFORMATION

Catering:
During the Neobiota conference, coffee breaks will be provided twice a day from 4 to 6 September at the C3 building where the parallel sessions are held. Lunch will be served at the C6 building. Due to the large number of attendees, it is suggested to divide participants into different lunch shifts to minimize queues. The lunch and poster sessions are conveniently located in the same building, allowing for easy transitions between the two.
Upon registration, you will receive lunch cards based on your choices during the online registration process. Please remember to wear your badges and bring your lunch cards with you.
On the pre-conference workshops day (September 3), the conference organization does not provide coffee breaks or lunches. However, a short ice-breaker reception will be held at the end of the day, offering a few refreshments and drinks. Participants of the pre-conference workshops can purchase lunch or coffee at the C6 cafeteria and restaurant or at various other university buildings.

Internet Access:
Internet access will be available within the conference facilities using EDUROAM for qualifying attendees or a dedicated login and password announced at the registration desk.

Facilities:
Accessibility: Easy access for disabled people; contact the organization for details.

Liability and Insurance:
The conference organizers do not accept liability for personal injuries or loss/damage to personal property. Attendees are advised to arrange their own insurance.

Lost and Found:
Please contact the registration desk for lost and found items.

Photography and Recording:
Recording is not allowed during the sessions to protect intellectual property.

Smoking:
Smoking is prohibited within university buildings in accordance with Portuguese law.

SOCIAL EVENTS AND TECHNICAL VISITS

Welcome Reception:

Light refreshments will be provided at the end of September 3, after the workshops period in the C6 building.

Conference Dinner:

The dinner will take place on September 5 at the Academy of Sciences, located at Academia das Ciências de Lisboa, Rua da Academia das Ciências, 19. We recommend using the available public transportation network to get to and from the event.

Technical visits:

The technical visits for NEOBIOTA 2024 take place Saturday September 7th.

All visits include transportation and at least a light meal (sandwiches + fruit + drink).

TECHNICAL VISIT #1

MANAGING ACACIA INVASION – SINTRA

The visit to the Sintra area, within the Sintra-Cascais Natural Park, promises a rich and engaging experience for participants of the scientific conference. It will feature a close examination of conservation efforts, starting with the control of *Acacia longifolia* (golden wattle) in the Tapada de D. Fernando, a picturesque forested region on the northern slope of the Serra de Sintra, which also houses the historic Convento dos Capuchos from the 16th century — an additional highlight for history enthusiasts. Moving towards the coast, participants will explore Cabo da Roca, the westernmost point of mainland Europe, to study the eradication of *Carpobrotus edulis* (ice plant) on rugged cliffs and elevated sand deposits, offering insights into coastal ecosystem management. The journey will culminate at the Colares stream, where attendees will observe innovative natural engineering techniques used to restore riparian galleries, including the control and removal of *Arundo donax* (giant reed). This field excursion not only showcases practical applications of ecological management but also provides an opportunity for networking and knowledge exchange among experts in the field.

8:30 Meeting point at the Faculty of Sciences, University of Lisbon – Rua Prof. Oliveira Marques
https://maps.app.goo.gl/Pqqgnkyhnd6Bsb4Y9
Travel from Lisbon to Tapada de D. Fernando
10:30 Acacia Observation Visit and Convento dos Capuchos Visit
12:30 Lunch
13:30 Travel from Tapada de D. Fernando to Cabo da Roca
14:00 Visit to Cabo da Roca
15:00 Travel from Cabo da Roca to Colares
15:30 Visit to Colares and surrounding areas
16:30 Travel from Colares to Lisbon

Optional - Visit to Queluz Palace and Gardens (if time permits, last ticket at 17:30).

TECHNICAL VISIT #2

INVADERS IN THE ESTUARY – SETÚBAL

Join us for an enlightening trip to Setúbal, a picturesque city situated by the Sado Estuary. This estuary is renowned for its rich biodiversity and has been designated a Natural Reserve due to its significant ecological value. However, it is also a hotspot for non-indigenous species, primarily introduced through commercial ports, recreational marinas, and aquaculture activities. During this visit, participants will explore some of these key locations where invasive species are prevalent. Additionally, we will learn about various initiatives and measures being implemented in the region to mitigate the introduction and impact of non-native species on the local ecosystems and human activities.

8:30 Meeting point at the Faculty of Sciences, University of Lisbon – Rua Prof. Oliveira Marques https://maps.app.goo.gl/Pqqgnkyhnd6Bsb4Y9
8:45 Departure of the tour bus to Setúbal
9:30 Visit to the port area of Setúbal
11:00 Visit to the Aquanostra aquaculture facilities
13:00 Lunch at Moinho da Mourisca (a tidal mill located in the Sado Estuary Natural Reserve)
15:00 Visit to Pontal dos Musgos (Invasive plant control actions and exploitation of invasive bivalves)
16:30 Visit to the Gâmbia winery
19:00 Return to the Faculty of Sciences, University of Lisbon

TECHNICAL VISIT #3

MEET THE IAS IN THE TAGUS RIVER – SANTARÉM

The lower Tagus River is one of the watersheds highly invaded by Invasive Alien Species in Portugal. During the morning of this visit, we will first visit an area where several invasive riparian plants, such as the reed/cane (*Arundo donax*), and tree-of-heaven (*Ailanthus altissima*) are being eradicated from a tributary of the Tagus (Alviela river) within the scope of the Alviela 7.7 Project, financed by REACT-EU/2021, of the Municipality of Santarém, and Natural Engineering Techniques are being used to restore the riparian corridor. We will also learn about the Santarém Municipality INVACRUSTACEA project financed by Fundo Ambiental, which aims to reduce the population of Red swamp crayfish (*Procambarus clarkii*) and Chinese mitten crab (*Eriocheir sinensis*) in the Alviela river. After lunch, we will be canoeing downstream the Tagus river from Santarém to Caneiras (a typical palafitic fishermen village). On this 5 kilometer (2 hour) descent, we'll have the opportunity to observe various invasive plants in the lower Tagus, such as the water hyacinth (*Eichhornia crassipes*), and we'll be able to enjoy the lovely landscape of the lower Tagus. At the end of this descent the Fish Invasion Team will explain several approaches to tackle the invasive European catfish (Silurus glanis) in the lower Tagus, such as the MEGAPREDATOR project and the LIFE-PREDATOR project.

This visit will have the technical support of the Environment and Sustainability Unit and is sponsored by the Municipality of Santarém, by offering the Tagus River canoeing descend and the afternoon Sunset drink and appetizer.

8:30 Meeting point at the Faculty of Sciences of the University of Lisbon (meeting point at Building C6 – Rua Prof. Oliveira Marques https://maps.app.goo.gl/Pqqgnkyhnd6Bsb4Y9)
10:00 Arrival to Alviela river, Pernes (Santarém) – area of intervention for invasive plants eradication, technical support by Environment and Sustainability Unit of Municipality of Santarém
12:30 Lunch at Ribeira de Santarém
14:00 Descend along the Tagus river to Caneiras village
16:00 Arrival to Caneiras village
16:30 Demonstration of sampling techniques directed to European catfish – MEGAPREDATOR Project and LIFEPROJECT
17:30 Sunset drink and Traditional appetizer offer by the Municipality of Santarém
19:00 Arrival to Faculty of Sciences of the University of Lisbon

WORKSHOP #1

INVASIVE ALIEN SPECIES AND THEIR IMPACTS ON POLICY-SECTORS

Organizers: Joint Research Centre – European Alien Species Information Network
Contact person: Chiara Magliozzi
Email: JRC-EASIN@ec.europa.eu
Location: Amphitheatre: 6.2.53, Breakout Rooms 6.2.48 and 6.2.50
Time period: 9:30-13:00

Invasive alien species (IAS) can have far-reaching impacts on ecosystems, as they disrupt natural habitats, displace native species, and contribute to a loss of biodiversity. These effects require the development of policies and regulations aimed at mitigating their negative consequences and safeguarding native flora and fauna. Understanding and assessing IAS impacts in relation to policy sectors is essential for the effective management of IAS.
What are the impacts of IAS on policy sectors? How to assess them? How to use this information to support IAS cross sector policy development and management?
As part of the Joint Research Centre (JRC), the "Alien Species Monitoring to Protect European Nature" project, conducted a literature review and consulted with experts to analyse the intentional or unintentional introduction of IAS and their potential positive or negative impacts on different policy sectors. The output of this work has the potential to enable a broader understanding of the problem, cross-sectorial use of IAS information, leading to improved coordination, integrated policy development, and more efficient resource allocation.
In the proposed workshop, participants will know about the methodology employed and the specific impacts identified. Through active engagement and discussion, participants will explore how to support the establishment of linkages between IAS and impacted sectors by providing expertise, and evidence-based recommendations to inform policy development and management strategies for IAS.

PROGRAM

9:30-10:15 Presentation on background, objectives of the workshop, first results of a pilot project and questions - Amphitheatre: 6.2.53
10:30-11:45 Work in break out groups - Rooms 6.2.48 and 6.2.50
11:45-12:00 Coffee break/pause
12:00-13:00 Discussion in plenary, conclusions and way forward - Amphitheatre: 6.2.53

WORKSHOP #2

BRIDGING THE LEXICAL DIVIDE: UNIFYING TERMINOLOGY FOR EFFECTIVE KNOWLEDGE AND MANAGEMENT OF BIOLOGICAL INVASIONS

Organizers: Irene Martin, Ana Novoa, Ismael Soto
Contact person: Irene Martin
Email: irene.martin@adelaide.edu.au
Location: Room 6.2.49
Time period: 9h30-12h30

Invasion ecology stands at the forefront of biodiversity conservation and ecosystem management, addressing the profound impacts of invasive species on natural habitats. Yet, amidst the urgency of this field, a linguistic chasm persists – one that impedes our collective progress. The importance of harmonizing terminology on biological invasions cannot be overstated. It is not merely an academic pursuit but a practical necessity, essential for realizing meaningful advancements in invasion ecology.

At this workshop, we delve into the heart of this linguistic challenge to harmonize different frameworks on the invasion ecology language. We recognize that the words we use to describe invasive species profoundly influence how we perceive, study, and manage them. Fragmented terminologies across scientific literature and management practices create confusion and hinder effective communication among researchers, policymakers, and stakeholders. The benefits of harmonizing terminology extend far beyond semantic clarity. It enhances the accuracy and reliability of scientific research, streamlines communication across borders and disciplines, and empowers evidence-based decision-making in invasive species management. By establishing a shared lexicon, we strengthen the foundation of invasion ecology, enabling more effective collaboration and impactful conservation actions.

Our workshop offers a platform to bridge this lexical divide. By fostering interdisciplinary dialogue and collaboration, we seek to standardize terminology, discuss the inclusion of impact, and aligning concepts across diverse contexts and disciplines within invasion ecology.

We invite researchers, practitioners, and policymakers to join us in this crucial endeavour. Through an interactive session, including expert-led discussions and case studies, participants can help transcending linguistic barriers, forging a unified language that propels us towards a more resilient and biodiverse future.

Together, let us redefine the narrative of invasion ecology – one word at a time.

PROGRAM

9:30-9:45 Round of Presentations

9:45-10:00 Introduction to the topic

Brief introduction to the existing controversy around terminology in the field of invasion science, and why it would be important to arrive at consensus within the scientific community, as well as between stakeholder groups.

10:00-10h:30 Introduction and discussion on the future questionnaire

Afterwards, we will introduce in 25 min the draft of a questionnaire we are designing to gather information on the perceptions of invasion scientists in the terminology of the field, and understand which terms are used more often and why. We will ask participants for input and opinions and will give everyone the chance to get involved on this project as much as they want.

10:30-11h:30 Break-out groups.

During the second hour of the workshop, we will have break-out groups to discuss certain concepts and questions related to terminology in invasion ecology, and design the specific sections of the questionnaire.

11:30-12:30 Discussion and way forward.

We will use the third hour to have a common discussion on the ideas convened by the different groups and agree on a way forward to start distributing the resulting questionnaire in October/November.

WORKSHOP #3

MAPPING AND ASSESSING THE CUMULATIVE IMPACT OF INVASIVE ALIEN SPECIES – THE CIMPAL INDEX ONLINE WORKFLOW

Organizers: Heliana Teixeira and Julien Radoux
Contact person: Heliana Teixeira
Email: heliana.teixeira@ua.pt
Location: Room 6.1.36
Time period: 9h30-12h30

NEOBIOTA 2024 workshop #3 will be a training workshop with focus on assessing the cumulative impact of invasive alien species using a new webservice to run the CIMPAL index workflow.
The CIMPAL index (Katsanevakis, Tempera & Teixeira, 2016) was implemented as an e-tool under a collaboration with LifeWatch-ERIC, the European e-Science Infrastructure for Biodiversity and Ecosystem Research that provides research facilities, resources and ICT technology support to scientists investigating biodiversity and ecosystem functions and services to address key ecological questions. Under a Virtual Research Environment, the CIMPAL workflow offers a flexible tool to map and assess the cumulative negative impact caused by invasive alien species (IAS). CIMPAL integrates information on IAS occurrences, habitat spatial distribution and the magnitude of the impact of those IAS in the ecosystems e.g. on biodiversity, on ecosystem services or any other type of impact (e.g., health, economic) that could be anchored to the defined spatial unit. One of the advantages of this cloud computing webservice is that it allows to integrate different types of information and process large datasets to perform wide-scale assessments (global, EU scale, national scale at high spatial resolutions (meters). This workflow offers flexibility to accommodate any impact assessment protocol, use any habitat classification, being applicable to both marine and terrestrial ecosystems, and perform multi-species assessments, as well as capability to aggregate the cumulative impact scores according to user-tailored criteria (spatial grids, administrative regions, habitats, countries, protected areas, etc…).

Participants will learn how to gather relevant data to run the CIMPAL index calculator and generate vulnerability maps of habitats most at risk from the cumulative negative impacts of IAS, identifying impact hot spots and impact footprints associated to pathways of introduction. Participants will also learn how to explore the outputs to prioritise species for management by ranking IAS according to complementary impact indicators. The hands-on session will be preceded by an introductory session presenting CIMPAL components and the new algorithm implementations, alerting for sources of uncertainty and reproducibility of the assessments. This webservice was implemented in a collaboration with Life Watch (LW) ERIC Internal Joint Initiative, involving researchers from the different LW national nodes such as Portugal, Belgium, Neetherlands (https://www.lifewatch.eu). This workshop is also supported by developments within the HEU projects GES4SEAS and B-Cubed.

PROGRAM

9:30-9:55 Welcome
- Context, objectives and structure of the workshop
- Overview of CIMPAL & previous applications & fitness for Policy needs
- CIMPAL ongoing developments/resources

9:55-10:30 Introducing CIMPAL workflow
- CIMPAL webservice implementation under Life Watch ERIC Tesseract VRE
- CIMPAL webservice implementation under Life Watch ERIC NaaVRE
- Overview of CIMPAL data requirements
- *New* Marine IAS Impact Database

10:30-11:45 Hands-on session
- Test CIMPAL webservice with dummy data
- Coffee break
- Explore CIMPAL results (dummy data)

11:45-12:30 Q&As session
- Doubts from participants on the use of CIMPAL
- Wrap-up

Target Audience:
This workshop targets PhD students, researchers at any career level, environmental managers and decision makers. No programming or coding skills are needed to run the CIMPAL workflow as the platform provides a friendly GUI.

Lecturers:
Heliana Teixeira University of Aveiro, LW PT PORBIOTA, GES4SEAS, B-Cubed
Julien Radoux University Louvain La Neuve, LifeWatch BE, online
Fábio Matos University of Aveiro, GES4SEAS, online

Relevant actions before workshop:
– Participants need to bring their own laptops!
– Prior to the workshop the participants need to register (free) to create an account at the LifeWatch platform. Go to https://my.lifewatch.eu and register with e.g. your Google account.
– Have a GIS software installed in your laptop (e.g. QGIS)
– No prior data preparation is needed as we will be using a dummy dataset for the workshop

Relevant links for workshop:
CIMPAL 2016 original paper:
https://onlinelibrary.wiley.com/doi/10.1111/ddi.12429
CIMPAL LW workflow Tutorial:
available at https://training.lifewatch.eu under User Manuals and Tutorials > Workflows > Biotope CIMPAL version

WORKSHOP #4

LIFE PROJECTS DEALING WITH INVASIVE SPECIES MANAGEMENT

Organizers: Filipe Ribeiro, Ricardo Gonçalves, Francisco Oliva-Paterna and Pietro Volta
Contact person: Filipe Ribeiro
Email: fmribeiro@fc.ul.pt
Location: Room 3.2.16
Time period: 9h30-13h00

The LIFE- Program is on important funding line to Manage Invasive Alien Species (IAS) within the European Union. In this Workshop, we would like to invite the different LIFE projects to share their main results in fighting IAS but as well share their approaches to solve problems related with the implementation and management of their projects. We hope thot we could raise some enthusiasm within more applicants to the LIFE- Program tackling IAS, especially those colleagues deal closely with this problem in their territories.

PROGRAM

9:30 Presentation, Workshop Objectives - **Filipe Ribeiro**
9:45 ForEst&FarmLand LIFE - Comprehensive management of forest and farming landscapes to improve the conservation status of Natura 2000 habitats and species. (LIFE18IPE/EE/000007) - **Eike Tammekand**
10:00 LIFE medCLIFFS - Towards an integrative management of Invasive Alien Plant Species in Mediterranean sea cliffs of European interest (LIFE20 NAT/ES/001223) - **Arnau Bosch-Guiu**
10:15 LIFE WADER - Water And Disturbance Environmental Restoration on the Northumbrian coast (LIFE20 NAT/UK/000277) - **Aileen Mill**
10h30 LIFE Riparias - Reaching Integrated and Prompt Action in Response to Invasive Alien Species (LIFE19 NAT/BE/000953) - **Arnaud Monty**
10h45 LIFEINVASAQUA - Aquatic Invasive Alien Species of Freshwater and Estuarine Systems: Awareness and Prevention in the Iberian Peninsula (LIFE17 GIE/ES/000515) - **Celia López-Cañizares, Francisco Oliva-Paterna**
11:00 LIFE PREDATOR - PREvent, Detect and combAT the spread Of SiluRus glanis in south european lakes to protect biodiversity (LIFE21 NAT/IT/101074458) - **Pietro Volta**
11:15 Coffee break / Pause
11:30 LIFE-FAGESOS - Phytophthora-induced decline of fagaceae ecosystems in Southern Europe exacerbated by climate change: preserving ecosystem services through improved integrated pest management (LIFE21 CCA/IT/101074466) - **Pablo González Moreno**
11:45 LIFE SNAILS - Support and Naturalization in Areas of Importance for Land Snails (LIFE20 NAT/PT/001377) - **Ricardo Abreu**
12:00 LIFE STREAMS - Salmo ceTtii REcovery Actions in Mediterranean Streams (LIFE18-NAT/IT/000931) - **Antonella Carosi**
12:15 LIFE RAFT - Rathlin Acting For Tomorrow: Removing invasive non-native ferrets and rats from the Rathlin Island SPA, Northern Ireland (LIFE20 NAT/UK/000349) - **Alexandra (Alusia) Malinowska**
12:30 LIFE MIRDINEC - Management of the invasive Raccoon Dog (*Nyctereutes procyonoides*) in the north-European countries (LIFE09 NAT/SE/000344) - **Fredrik Dahl**
12:45COOP CORTADERIA - Stop Cortaderia + Development and implementation of a transnational alliance against Cortaderia (LIFE22 NAT/ES/101113757) - **Hélia Marchante**

WORKSHOP #5

INCREASE RESEARCH SUPPORT TO EUROPEAN POLICIES ON ALIEN SPECIES

Organizers: Riccardo Scalera
Contact person: Riccardo Scalera
Email: scalera.riccardo@gmail.com
Experts involved: Helen Roy, Piero Genovesi, Ana Nunes, Wolfgang Rabitsch, Tim Adriaens, Quentin Groom, Jodey Peyton, Giuseppe Brundu, Elena Tricarico
Location: Room 6.2.53
Time period: 14h00-17h30

Research can be a useful ally for the sound implementation of European policy on IAS, including the EU Regulation on IAS, but also other nature-related EU legislation, as well as the recommendations of the Council of Europe, the CBD etc. Identification of key knowledge gaps in relation to the tools and information needed to implementation of these regulations may inspire new topics for future research, which in turn would improve the impact of the relevant policy instruments.

Concept

The development and further implementation of the EU Regulation on IAS are strictly dependent on the advance of scientific knowledge on the issue. This legislation has been always characterised by an inclusive and evidence-based approach to policy-making, thanks to the accessible, transparent and conspicuous work regularly carried out at the science-policy interface. For example, both horizon scannings and risk assessments need to be underpinned by robust scientific data and wise use of expert opinion, with outputs and uncertainties made openly available to stakeholders. The same applies to relevant response actions, to ensure that management measures are planned, implemented, monitored and evaluated as appropriate.

Despite best efforts to gather sufficient and reliable data, for example in relation to the impacts and distribution of many IAS, knowledge gaps remain, especially in relation to documented evidence that can inform horizon scanning, risk assessment and the drafting of management (risk management) actions. These gaps represent a major challenge to the development and implementation of policies to address this key driver of biodiversity loss. This is a more general problem, as for example pointed out by Coughlan et al. (2020), who noted the importance to improve harmonisation and quality of information presented among the key relevant databases available. The recent IPBES assessment also highlighted areas where data deficiencies must be addressed, along with policy needs and mismatches. Closing these gaps is considered a first step towards a new surge of research, management and policy for biological invasions (Roy at al. 2024).

Nevertheless, scientists may be unaware of the key gaps to address, which may create a mismatch between the supply and demand of research data, including for example, between ecological research data available vs. those required for an optimal implementation of the EU IAS regulation. This workshop wants to help bridge the gaps between research and real-world application of policy and management measures. This requires the work undertaken by ecological researchers, where possible, being more closely linked to the identified data needs on IAS required for a better-informed policy development and implementation (for example, by improving the knowledge and understanding of the ecological dynamics which describe the relationship between IAS and threatened species and ecosystems).

The objectives of this workshop are to: 1. discuss and analyse the different activities carried out as part of the implementation of the European IAS and the EU IAS Regulation, 2. highlight data and information gaps that (may) have hindered an optimal implementation of the same regulation, and ultimately contribute to mitigating the impact of biological invasions. This represents a fundamental opportunity for ecological researchers to understand how to better contribute to conservation in practice.

For this purpose, a number of short presentations will be presented by experts at the science-policy

interface with strong expertise in the EU Regulation on IAS, including on the data available to inform its implementation, and on some of the knowledge gaps which have been experienced in providing the evidence base for implementing and supporting its implementation. Questions will be circulated to all participants to invite successive rounds of feedback and discussion, by applying an elicitation process based on the Delphi method. Questions will likely be circulated through an online platform, hence participants are encouraged to have their smartphones or laptops with them for active involvement. A report with full results will be circulated to all participants after the workshop.

PROGRAM

- Introduction - **Riccardo Scalera**
  - How to reply to questionnaires: **Diederik Strubbe**
  - "Welcome" questionnaire
- Presentations
  - EU IAS Regulation: **Piero Genovesi**
  - IPBES Assessment on IAS and their control: **Helen Roy**
  - Horizon scanning: **Jodey Peyton**
  - Risk assessment: **Wolfgang Rabitsch**
  - SDMs: **Tim Adriaens**
  - Management: **Ana Nunes**
  - Surveillance/monitoring: **Quentin Groom**
  - Systematic and taxonomic challenges: **Giuseppe Brundu**
  - Researchers role: **Elena Tricarico**
- Discussion on presentations
- Start of elicitation
  - Questionnaire for elicitation (1st round) and relevant discussios
  - Questionnaire for elicitation and relevant discussion

Target audience:

All participants (academics, professionals from relevant organisations, authorities, etc.).

Experts involved:

Helen Roy, Piero Genovesi, Ana Nunes, Wolfgang Rabitsch, Tim Adriaens, Quentin Groom, Jodey Peyton, Giuseppe Brundu, Elena Tricarico, Diederik Strubbe

WORKSHOP #6

LIVING WITH THE PLAGUE: ZEBRA-MUSSEL MANAGEMENT IN INVADED SYSTEMS

Organizers: Joaquim Reis
Contact person: Joaquim Reis
Email: joaquim.reis@fc.ul.pt
Location: Room 6.2.49
Time period: 14h00-17h30

The zebra-mussel (*Dreissena polymorpha*) is a freshwater bivalve native to the caspian sea that has become invasive in many regions of the world. In Europe, its expansion initiated early in the xx century facilitated by the construction of navigation connections between river catchments. This species causes severe ecological and economic damage to the invaded systems, due to its ability to attach to any hard surface and attain very high densities. This leads to changes in the water quality, direct impact to native bivalves, and malfunctioning of hydraulic structures such as irrigation schemes, hydropower plants and others. Prevention is key to avoid the expansion of the species, but management is essential to minimize its impacts in the invaded systems. Many options have been used to try to reduce zebra-mussel population densities and its ability to attach to underwater surfaces, from physical approaches (variation of water depth, desiccation and raise of temperature), chemical (use of chlorine compounds) or biological (species-specific pathogens). This workshop aims to discuss different approaches used across the world by different stakeholders, their pros and cons, outcomes and implications to improve future management of the species.

PROGRAM

14:00 Presentation, Introduction and Workshop Objectives
14:30 The Zebra Mussel: Impacts and Monitoring – **Joaquim Reis** (BIOTA & MARE)
15:00 Prevention and eradication of Zebra Mussel on the Alqueva Multipurpose Infrastructure - Ana Ilhéu (EDIA)
15:30 20 years of Zebra Mussel expansion in Spain: Lessons Learned - Concha Durán (Confederación Hidrografica del Júcar)
16:15 Zebra Mussel control in invaded systems: pros and cons of available options - David Aldridge (University of Cambridge)
17:00 Round Table

WORKSHOP #7

ECONOMIC UTILIZATION OF INVASIVE SPECIES: AN OPPORTUNITY OR A THREAT?

Organizers: Giovanni Vimercati
Contact person: Giovanni Vimercati
Email: gvimercati@outlook.com
Location: Room 3.2.16
Time period: 14h00-17h30

The economic utilization of invasive species has recently emerged as a contentious issue in conservation science. While some organizers advocate its adoption as a crucial means for controlling invasive species, critics caution against the potential risks associated with further introduction and spread. This dichotomy underscores the complex and multifaceted nature of invasive species management.

This workshop aims to explore the diverse perspectives and implications surrounding the economic utilization of invasive species. Through a series of interactive discussions, presentations, and case studies, participants will critically examine the merits and drawbacks of utilizing these species as a tool for their control.

Organizers argue that economic incentives and adequate legislation can catalyse innovative approaches to invasive species management, potentially reducing their negative impacts while fostering economic growth in industries such as agriculture and biotechnology. However, the workshop will also scrutinize the lack of empirical evidence demonstrating the effectiveness of invasive species utilization in achieving effective management.

Critics express apprehensions about the unintended consequences of utilizing invasive species for economic purposes, such as inadvertently causing their intentional introduction or unintentional spread. Invasive species utilization might also lead to devalue the contributions of native biodiversity to people or induce an excessive economic reliance on invasive species within certain human communities, who might then oppose against eradication programs. The workshop will delve into the validity of these concerns and will assess whether utilizing invasive species have hindered or facilitated conservation efforts aimed at reducing their negative impacts.

Through knowledge exchange, open discussions, and networking opportunities, the workshop will explore the economic utilization of invasive species from an evidence-based perspective and enable the participants to contribute to a synthesis paper informing policy, research, and practice in invasive species management.

PROGRAM

14:00 General introduction to the topic - Giovanni Vimercati – University of Fribourg
14:15 Case Studies

Acacia compost – from waste to resource
Joana Jesus, Faculdade de Ciências da Universidade de Lisboa
Summary: Our case-study tested the effect of incorporating Green-waste compost (Gwc) from *Acacia longifolia* in degraded soils. Physicochemical properties and microbial composition were assessed. Results point out for increased organic matter and water content when Gwc is incorporated as well as a richer and more diverse microbiome, ultimately boosting plant development.

Economic utilization of invasive fishes in India
Lohith Kumar, Leibniz Institute of Freshwater Ecology and Inland Fisheries
Summary: Following the global phenomenon, India too has witnessed the introduction of non-native fish species, of which a few are now considered invasive. Here, we present examples of the economic utilization of three invasive fishes in India. Examples are the Silver carp *Hypophthalmichthys molitrix* in the Gobind Sagar Reservoir, Nile tilapia *Oreochromis niloticus* in the Halai Reservoir, and South American armored catfish *Pterygoplichthys* spp. in the East Kolkata Wetlands (EKW). After the introduction of these invasive fishes in the respective water bodies, deleterious effects started appearing in the form of disrupted existing fishery, damage to fishing nets, damage to dykes, etc. Silver carp and Nile tilapia became dominant fisheries in the respective reservoirs, but there was no market for these fishes;

therefore, these fishes were not fetching good prices. However, over a period of time, markets were created, and supply chains were set up. Now, Silver carp and Nile tilapia have become the primary source of income for the fishermen in these reservoirs. South American armored catfish is harvested in huge quantities (>500 kg/hectare/year) in the EKW. They are generally discarded on the pond bunds to be eaten by dogs however, they are also used as feed for other fishes (by mincing/crushing them in machines) in culture ponds.

Economic utilization of invasive crayfish in Berlin

Jonathan Jeschke, Leibniz Institute of Freshwater Ecology and Inland Fisheries

Summary: Several invasive crayfish species have become abundant in Berlin in recent years, for example the red swamp crayfish (*Procambarus clarkii*) and the marbled crayfish (*Procambarus virginalis*). One management measure that has been applied is the economic utilization of the crayfish, first by a fisherman and then by the Holycrab! team (https://holycrab.berlin). Numbers of crayfish captured and economically utilized have shown a slight decline since the beginning of this management measure, but data quality is limited and some unintended consequences have been observed. On the positive side, it seems that public awareness of biological invasions has increased as a result of these efforts.

Economic and ecological impacts of the use of *Pittosporum undulatum* in beekeeping in Santa Maria - an evaluation in the context of the LIFE SNAILS project

Ricardo J. F. Abreu, Secretaria Regional do Ambiente e Ação Climática

Summary: This presentation is about the use of *Pittosporum undulatum*, an invasive alien species, in apiculture on the island of Santa Maria, Azores. Despite being a target species for control under the LIFE SNAILS project, *Pittosporum undulatum* is an important resource for honey production on the island. We will analyse the economic impact of the removal of this plant on local beekeepers, highlighting the impact of control activities on the incomes of 47 beekeepers, 77 apiaries and around 500 hives. As a solution, LIFE SNAILS is working on gradually replacing the *P. undulatum* forest with endemic ones (*Picconia azorica* (Pau Branco), *Erica azorica* (Urze), *Vaccinium cylindrace* (Uva Serra), *Myrica faya* (Faia-da-terra) and *Laurus azorica* (Louro)) where these offer more favourable economic and environmental alternatives for local beekeepers.

Economic Utilization of Invasive Mexican Sunflower (*Tithonia diversifolia*) in Jos, Nigeria

Quadri A. Anibaba, Polish Academy of Science

Summary: The presentation will engage the participants about the distribution of *T. diversifolia* in Jos. I will show photos from field observations and the interaction with the local communities on how they use *T. diversifolia* stems for fuelwood and the usage of the plant leaves and stems for green manure on farmlands. My presentation would support how the utilization of *T. diversifolia* has generated an unintentional spread of the species.

How productive introductions by governmental policy have caused ecological and economic turmoil in mainland Ecuador

Felipe Espinoza, University of Edinburgh

Summary: The agricultural policy of Ecuador has introduced formally four species in different periods of time in recent history, which have dispersed into different zones of the country, causing an economic and ecological impact that surpasses the EU in the case of the American Bullfrog (Santay Island in the Ecuadorian coast), African Snail (Yasuni National Park in the Amazon) and *Pinus patula/radiata* (Cotopaxi National Park in the Andes), particularly in protected areas. Tilapia on the other hand has devastated native fish populations in coastal rivers but have had a mild impact and a strong economic benefit in the Amazon region. In conclusion, unplanned government productive policies caused unintended challenges for species conservation in sensitive ecosystems in mainland Ecuador, I will be using the available economic and ecological impact information for the four cases, and showing distribution and dispersal of the species in a simplified timeline.

When invasive alien plant species become iconic thanks to their economic utilization - case examples along Mediterranean Europe

Jordi López-Pujol, Institut Botànic de Barcelona

Summary: In Mediterranean Europe, some inva-

sive alien plant species have been economically used (Agave for making cords and fibers, but also to delimit fields and as ornamental; Opuntia as an alimentary plant but also to delimit fields as well as ornamental). These taxa were introduced into the Mediterranean basin in the 16th century, and soon became part of the landscapes (by their massive cultivation but also because they became naturalized) and, in some places, aggressive invaders. Today, there are management plans to control and eradicate them, but a large part of the society is reluctant to it (even with campaigns to "defend these plants from humans) because they are now a sort of iconic plants. Even now they are used as a tourist attraction (in Malta or in Sicily, where there are plenty of ceramics in shops depicting Opuntia) or as a symbol of nature conservation (a recent advertisement on Catalonia's public TV used an image of Opuntia ficus-indica to indicate the new tax on petrol-driven cars.). In summary, the old economic uses are now transformed to other uses (economic -tourism- but also symbolic).

The Atlantic blue crab in Italy: is embracing the "if you can't beat them, use them" philosophy the right choice?

Andrea Monaco, ISPRA, Institute for Environmental Protection and Research

Summary: The recent demographic explosion and spread of the Atlantic blue crab *Callinectes sapidus* in Italy has caused heavy economic losses (especially on shellfish farming) and triggered critical social issues. The extent and speed of its spread also suggests the presence of significant impacts on biodiversity, which are currently being assessed. In an attempt to contribute to the containment of the Atlantic blue crab population, by now impossible to eradicate, and to transform, at least in part, a problem into an economic resource, the Italian government has immediately focused on encouraging consumption of the species, also through regulatory changes aimed at facilitating the creation of a commercial supply chain. At the same time, two Italian universities have also begun an experiment on the use of chitin in exoskeletons in bioengineering. The first data on the economic revenues from the commercialisation of the Atlantic blue crab are presented and the opportunities and criticalities of the economic use of this invasive alien species in Italy are discussed.

The fallacy of the economic utilization of the red swamp crayfish marketed as a control strategy

Fran Oficialdegui, University of South Bohemia

Summary: The motivation behind deliberate introductions of invasive species often revolves around their economic value. In Spain, the red swamp crayfish (*Procambarus clarkii*) was introduced for commercial purposes in the 1970s. Despite being listed by the European Union since 2016, it is permitted to be exploited due to its introduction over 50 years ago and its significant socioeconomic value in the region. It is well-known that aquatic invasive species are difficult, if not impossible, to eradicate once widely distributed in open waters. The situation of an invasive species widely distributed with economic value has led many administrations to implement a kind of control strategy, aimed more at appeasing the commercial crayfish lobby than implementing effective conservation-focused control measures. In this short presentation, I will discuss recent events in Spain regarding the commercialization of the red swamp crayfish, regulations and the administration actions. While flexible approaches are necessary for invasive species that have become established and are difficult to control, we should refrain from labeling these actions as a 'control strategy'.

Use of alien amphibians and reptiles in the Philippine

Arman Pili, University of Potsdam

Summary: 1. The American Bullfrog for Scientific Specimen materials (and later food) in the 1980s. 2. The Chinese Bullfrog, following the failure of the American Bullfrog industry, in the 2000s. 3. The Asiatic Painted Narrowmouth Toad eggs (replacement of native species). 4. The exportation of invasive Chinese Softshelled Turtles back to China.

Non-Native Marine Fishes at the Panama Canal: a valuable economic resource for fisheries?

Gustavo Castellano, Leibniz Institute of Freshwater Ecology and Inland Fisheries

Summary: A handful of marine, mainly predatory, fish species inhabit and transit the predominantly

freshwater Panama Canal in Central America. Some of these species are highly prized by the recreational fishing sector in Panama and elsewhere (e.g. The IUCN Vulnerable, Atlantic Tarpon). The presence of these fishes makes the Canal and adjacent coastal areas a dream destination for sport fishers creating substantial economic benefits for this sector in Panama. Little is known about the potential ecological impacts that these top predators can have in their currently occupied non-native ranges. I will present some examples of the challenges involved with dealing with this non-native species in this system.

Eichhornia crassipes turning challenge into opportunity?

Letícia da Silva Brito, Universidade de Aveiro

Summary: According to the systematic review, different types of management have been utilized to control the most invasive plant, *Eichhornia crassipes*. The largest number of publications are found in India and China. According to InvaCost, a database based on the global estimate of the economic cost of biological invasions, *Eichhornia crassipes* is estimated to cost $5.3 billion globally, with India accounting for $56.6 million. Although this value may be underestimated, it reflects the investments in management, control, and dissemination of information regarding this macrophyte. The significant costs in China and India are linked to phytoremediation efforts and the production of biomass-based products, such as biogas. This suggests that these highly populated countries, under environmental pressure, may find ways to transform these challenges into opportunities for cost-effective and environmentally friendly water management techniques. There is no information available regarding the consequences on the EU for conservation.

17:00 Full-group and breakout group discussions, potentially leading to the development of a synthesis paper.

WORKSHOP #8

CITIZEN SCIENCE AND INVASIVE ALIEN SPECIES

Organizers: Elizabete Marchante and Hélia Marchante
Contact person: Elizabete Marchante
Email: elizabete.marchante@gmail.com
Location: Room 6.1.36
Time period: 14h00-17h30

This workshop aims to explore the role of citizen science at various stages of biological invasion management, from early detection to reporting of invasive species and monitoring of established biological control agents. Practical case studies will be used to illustrate these applications.

PROGRAM

The workshop will be divided into several parts:
14h00 Introduction and debate: This session will feature several short presentations on citizen science projects related to alien or invasive species, followed by a group discussion (indoors).
15h00 Survey development: Participants will collaborate on the creation and testing of a survey, which will later be distributed more broadly to gather insights ion the use of citizen science by scientists and managers (indoors).
16h30 Field Activity using iNaturalist: Participants will use the iNaturalist app to report sightings of alien or invasive species in the vicinity of the conference venue (outdoors). This part may be omitted depending on the time required for the first two parts and the number of interested participants

PROGRAM

WORKSHOPS — TUESDAY SEPTEMBER 3RD

MORNING — 3 HOUR DURATION, STARTING AT 9:30

Workshop #1 — ROOM 6.2.53	Workshop #2 — ROOM 6.2.49	Workshop #3 — ROOM 6.1.36	Workshop #4 — ROOM 3.2.16
Invasive alien species and their impacts on policy-sectors By Joint Reseach Centre – European Alien Species Information Network	Bridging the lexical divide: unifying terminology for effective knowledge and management of biological invasions By Irene Martin	Mapping and assessing the Cumulative IMPact of invasive ALien species: The CIMPAL index online workflow By Heliana Teixeira	LIFE Projects dealing with invasive species management By Filipe Ribeiro

AFTERNOON — 3 HOUR DURATION, STARTING AT 14:00

Workshop #5 — ROOM 6.2.53	Workshop #6 — ROOM 6.2.49	Workshop #7 — ROOM 3.2.16	Workshop#8 — ROOM 6.1.36
Increase research support to European Policy on alien species By Riccardo Scalera	Living with the plague: zebra-mussel management in invaded systems By Joaquim Reis	Economic utilization of invasive species: an opportunity or a threat By Giovanni Vimercati	Citizen science and invasive alien species By Elizabete Marchante

6:00 PM	WELCOME DRINKS C6 INNER GARDEN

WEDNESDAY SEPTEMBER 4TH

		C3 ROOM A		C3 ROOM B		C3 ROOM C
9:00				OPENING CEREMONY		
9:30				KEYNOTE by Anthony Ricciardi Do uncontrolled invasion rates threaten ecosystem sustainability?		
10:00	Chair: Franck Courchamp, Josie South	SESS#1 Emma Blackwell-Arpaci Innovative control of the invasive tree species *Ailanthus altissima* with a natural, selective herbicide (Ailantex®) developed on the basis of the wilt fungus *Verticillium nonalfalfae* strain Vert56	Chair: Philip Hulme, Riccardo Scalera	SESS#1 Jon Blanco González Optimizing control strategies for invasive monk parakeets (*Myiopsitta monachus*): Insights from capture methods and bait preferences in Madrid	Chair: Sofia Duarte, Paula Chaínho	SESS#5 Antonio A Herrero Reyes Biology and catchability of the Atlantic blue crab in a corridor habitat from the Mar Menor coastal lagoon (Western Mediterranean)
10:15		SESS#1 Arman N. Pili Forecasting potential invaders to future-proof preventative biosecurity globally		SESS#1 Tim Adriaens Alien plants on the not so distant horizon: a risk screening of potentially invasive plant species in european-atlantic coastal dune habitats		SESS#5 Lisa Tedeschi A synthesis on alien mammals threatened in their native range
10:30		COFFEE BREAK C3				

WEDNESDAY SEPTEMBER 4TH

		C3 ROOM A		C3 ROOM B		C3 ROOM C
11:00		SESS#1 **Eike Tammekänd** 20 years of Heracleum IAS eradication – Estonias experience		SESS#1 **Ana Nunes** Demystifying the EU IAS Regulation		SESS#5 **Ronaldo Sousa** Biological invasions: the hidden side of the population level
11:15	Chair: **Franck Courchamp, Josie South**	SESS#1 **Cayetano Herrera** Risk posed by hornets to the provision of pollination-dependent food production	Chair: **Philip Hulme, Riccardo Scalera**	SESS#1 **Jon Bray** Bridging human, animal, plant/algal and ecosystem health in aquatic environments through One Biosecurity	Chair: **Sofia Duarte, Paula Chaínho**	SESS#5 **Antoine Flandroit** Stronger together: can gregariousness explain the first and only sea spider invasion in the world?
11:30		SESS#1 **James Hodson** Temperature-dependent impact predictions for the invasive narrow-clawed crayfish (*Pontastacus leptodactylus*) relative to the signal crayfish (*Pacifastacus leniusculus*), and predicted range alterations under climate change		SESS#1 **Jaime Fagúndez** Vegetative growth and leaf composition in the invasive grass *Cortaderia selloana* after cutting		SESS#5 **Udi Segev** A meta-analysis of trait evolution in invasive plants with time since introduction
11:45		SESS#1 **Ramona Maggini** Potential distribution of *Aromia bungii*, a new invasive pest in Europe		SESS#1 **Celia López-Cañizares** Prevention and awareness of aquatic invasive alien species in the Iberian Peninsula by the LIFE INVASAQUA European project: Outcomes		SESS#5 **Filip Ložek** Overlooked biodiversity losses: the fate of European crayfish ectosymbionts amidst the invasion of signal crayfish
12:00		SESS#1 **Yaiza R. Lueje** The management of despair: testing a common non-recommended method for mitigation of Vespa velutina damage in vineyards		SESS#1 **João Rato** How to not stop an invasion: Blacklists as control and prevention measures for exotic freshwater turtles		SESS#5 **Alejandra Oyanedel** Diversity of benthic communities after 15 years of invasion of *Didymosphenia geminata* in Patagonian rivers
12:15		LUNCH & POSTER SESSIONS C6 (SESSIONS 1 AND 4)				

WEDNESDAY SEPTEMBER 4TH

		C3 ROOM A	C3 ROOM B	C3 ROOM C
14:00			KEYNOTE by **Nuria Roura-Pascual** Setting the course for the future management of biological invasions in europe	
14:30	Chair: Laura Meyerson, Heliana Teixeira	SESS#1 **Ella Ahti** Barents Invasive Alien Species: Encouraging to IAS management through collaboration and communication	SESS#1 **Pankaj A. Gorule** Long-term sublethal exposure to polyethylene and tire wear particles: Effects on risk-taking behaviour in invasive and native fish	SESS#5 **Petr Pysek** Plant invasions in the Kruger National Park: what do we need to know and how to find it out?
14:45		SESS#1 **Anna Tilling** Investigating the potential for biological control of the invasive aquatic plant, *Myriophyllum aquaticum*	SESS#1 **Frances E. Lucy** Invasive alien species: improvement of understanding and communication	SESS#5 **Thomas Nuhfer** Abundance distributions of invasive and non-invasive terrestrial plant species
15:00		SESS#1 **Shaquille Matthys** Dealing with uncertainty and conflicting objectives in the control of invasive alien species	SESS#1 **Ricardo Enrique Hernandez-Lambraño** Environmental drivers and plant biodiversity influencing *Xylella fastidiosa* (Xf) impact across a mixed agriculture-forest landscape	SESS#5 **Augustin Clessin** Amsterdam Island – introduced mammals play critical role in the epizootic of avian cholera that threaten the seabird community
15:15		SESS#1 **Laura Hernández Sánchez & María Verdugo Althöfer** Aquatic invasive alien species (IAS) GIS-Viewer	SESS#1 **Andrea Monaco** Prioritizing invasive alien species in Italy	SESS#5 **Marcin K. Dyderski** Does the impact of invasive trees on temperate forests scale along their abundance gradient?
15:30	Chair: Piero Genovesi, Stephan Gollasch	SESS#1 **Elizabete Marchante** Mobilizing citizens and stakeholders: The Portuguese Network for Invasive Species Study and Management	SESS#1 **Zafrir Kuplik** *Rhopilema nomadica* in the Mediterranean: Where from and why now?	SESS#5 **Alejandro Bernal-Ibáñez** The invasion by *Rugulopteryx okamurae* in a barren-state dominated coast leads a phase-shift in rocky coastal systems
15:45		SESS#1 **María J. Servia** Knowing the enemy: Impact of *Spanolepis selloanae* (Diptera: Cecidomyiidae) in seed germination of the invasive plant *Cortaderia selloana* (Poaceae)	SESS#1 **Ana S. Lavrador** Mapping the Spatial Distribution of Non-Indigenous Invertebrates in Recreational Marinas Across Mainland Portugal and Islands through DNA Metabarcoding	SESS#5 **Miguel Clavero** How (not) to use genetics to assess nativeness
16:00	Chair: Ana Cristina Cardoso, Francisco Oficialdegui	SESS#1 **Ane Marlene Myhre** Preventing invasive species and being prepared: How key options identified by the IPBES are solved in Norway	SESS#1 **Bárbara Segal** Bridging Biology and Engineering: Advanced Solutions for Sun Coral Invasion	SESS#5 **Yohann Soubeyran** The threat of invasive alien species on the threatened species of the French overseas territories: an analysis of the French national IUCN Red Lists
16:15		COFFEE BREAK C3		

WEDNESDAY SEPTEMBER 4TH

		C3 ROOM A	C3 ROOM B	C3 ROOM C
16:45		SESS#1 **Sonal Varia** Use of the rust fungus *Puccinia komarovii* var. glanduliferae for the management of *Impatiens glandulifera* in the UK	SESS#1 **Donald C. Behringer** Emerging parasite infects invasive rusty crayfish, tempers invasion impacts, and triggers ecosystem recovery	SESS#5 **Sergio Bedmar** Travelling riverside blues: Long-distance migration of the invasive atlantic blue crab
17:00		SESS#1 **Nicolas Trunfio** Comparison of the attachment strength of invasive quagga and zebra mussels from the Rhine River depending on substrate type and water velocity	SESS#1 **Liliana N. Duarte** Managing the seed legacy of an invasive plant in coastal dunes	SESS#5 **Eva Malta-Pinto** Perspectives on policy and governance for biological invasions: Legal, economic, and beyond
17:15		SESS#1 **Fredrik Dahl** Nordic raccoon dog management 2010 – 2023 – successes, failures, and their associated reasons	SESS#1 **Lizzie Keen** A review of the effectiveness of different management methods for IAPs in woodlands and forests globally	SESS#5 **Jessica Bernal-Borrego** Incorporating Local Insights Through Interviews and a Participatory Workshop for Invasive Species Management in Southeastern Iberian Arid Ecosystems
17:30		SESS#1 **Aileen Mill** Prioritisation frameworks to guide IAS management decision making at multiple scales	SESS#1 **Sónia Duarte** Invasive *Cryptotermes brevis*: a growing concern for wooden structures in Portugal	SESS#5 **Roi Dor** Insights from studying one of the worse avian invaders in the world
17:45		SESS#1 **Lawrence Kirkendall** A paws for thought: Assessing the ecological footprint of domestic cats	SESS#1 **Teun Everts** Phenological mismatches mitigate the ecological impact of a biological invader on amphibian communities	SESS#5 **Duarte Martins** Aliens lying beneath the rhodoliths: new reports of Polychaeta non-indigenous species (NIS) found in Iberian Peninsula associated with crustose coralline red algae
18:00		SESS#1 **Gaute Velle** Balancing the restoration of a native fish and the risks of hitch-hiking invasive species	SESS#1 **Magdalena Szymura** Time matters - the story of species-rich, semi-natural grassland restoration in a site dominated by invasive *Solidago* sp.	SESS#5 **Ana Filipa Filipe** The rise of non-native species: characterizing Iberian freshwater fish communities to guide conservation strategies
18:15		SESS#1 **Sylvestre Badou** Three-year survey of native and invasive small mammal communities in the Autonomous Port of Cotonou, Benin: community ecology, population genetics and pathogen detection	SESS#1 **Catarina Afonso** Assessing the effectiveness of *Trichilogaster acaciaelongifoliae* as a biological control agent against *Acacia longifolia* in Portugal: a System Dynamics Modeling approach	SESS#5 **Renan Leite** Assessing the impact of invasive bleak on Iberian barbel habitat utilization in fluctuating flow environments
18:30		SESS#1 **Maude Vernet** Assessing invasion risks using EICAT-based expert elicitation: application to a conservation translocation	SESS#1 **Kateryna Davydenko** Overlap two invasive ash pests in Europe: what's in the future hold?	SESS#5 **Marcos Rubal** Removing invasive kelp species in recreational marinas to preserve a native one
18:45		SESS#1 **Duran Chetty** The issue of "sterile cultivars": *Duranta erecta* as a case study		

Chair: Ana Nunes, Ricardo Rocha

Chair: Elena Tricarico, Elizabete Marchante

Chair: Joana Vicente, Miguel Clavero

THURSDAY SEPTEMBER 5TH

		C3 ROOM A		C3 ROOM B		C3 ROOM C
8:30				KEYNOTE by **Elena Tricarico** How Citizen Science empowers people to tackle biological invasions		
9:00	Chair: Luis Reino, Tim Adriaens	SESS#1 **Elena Ortega Jiemenez** Uncovering trophic variability of the invasive Atlantic Blue crab *Callinectes sapidus* along an invaded Atlantic area by stable isotopes	Chair: Anthony Ricciardi, Simone Guareschi	SESS#1 **Manuel Sá Sampaio** Can endangered native fish be used to control invasive amphibians?	Chair: Petr Pysek, Sandra Hudina	SESS#5 **Montserrat Vilà** Field studies of ecological impacts of invasive plant species in Europe
9:15		SESS#1 **Lisa Andrea Moser** Evaluating animal welfare for multicriteria decision analysis in the management of the invasive pond slider *Trachemys scripta*		SESS#1 **Kjetil Hindar** Pink salmon in Norway – assessment of risk to biodiversity, wild salmonids and aquaculture		SESS#5 **Ana Novoa** Impacts of invasive plants on soil and its microbial communities in riverine habitats of a South African savanna
9:30		SESS#1 **Sonia Vanderhoeven & Arnaud Monty** Bridge from observation to action: crafting effective management frameworks - lessons from the LIFE RIPARIAS Project		SESS#1 **Olga Delange** Seed bank dynamics of *Ludwigia* spp. – invaded ecosystems in Belgium		SESS#5 **Rui Rivaes** A four-decade follow-up of the native fish communities and alien invasions in the lower tagus river
9:45		SESS#1 **Heliana Teixeira** Assessing and mapping the cumulative impact of invasive alien species – the new CIMPAL index e-tool workflow		SESS#1 **Flavio Marzialetti** Prioritizing management actions for emergent invasive non-native plants through expert-based knowledge and Species Distribution Models		SESS#5 **Guillaume Latombe** Ethical dilemma in conservation: a trolley problem thought experiment
10:00		SESS#1 **Jacob Barney** US state invasive species policies lack consistency, need coordination		SESS#1 **Filipe Romão** Preventing invader's expansion: Development and assessment of a selective vertical slot fishway to preclude a non-native invasive cyprinid passage		SESS#5 **Michal Hnilička** Stable isotope analysis reveals fish juveniles as a temporal dominant in the diet of invasive pumpkinseed (*Lepomis gibbosus*)
10:15		SESS#1 **Gianni Gilioli** The EFSA methodology for environmental risk assessment for invasive plant pests		SESS#1 **Arman Pili** Addressing Environmental Sampling Bias: a crucial oversight undermining the usefulness of Species Distribution Modelling in Geographic Risk Assessment of Alien Species		SESS#5 **Quadri A. Anibaba** The stage of succession in the post-mining vegetation determines the inhibitory effect of both native and alien species
10:30		COFFEE BREAK C3				

THURSDAY SEPTEMBER 5TH

		C3 ROOM A		C3 ROOM B		C3 ROOM C
11:00		SESS#1 **Inês Afonso** Non-native species in tagus recreational marinas: which factors are more relevant to the establishment? Status, trends and monitoring		SESS#3 **Anna Schertler** Biogeographically novel and co-xenic novel associations are common in alien fungal and fungus-like plant pathogens		SESS#5 **Mathieu Denoël** Multiple invasions, ecological opportunism and effects on pond biodiversity of a major amphibian invader, the marsh frog
11:15	**Chair: Ana C. Costa, Filipe Banha**	SESS#2 **Nikol Kmentová** Detection of invasive and alien land planarians as threats to agriculture and ecosystem stability	**Chair: Maria Cristina Duarte, Ignacio Gestoso**	SESS#3 **Csilla Balogh** Competition between congeners: has the zebra mussel chance against the newcomer quagga mussel? A long-term monitoring study on the invasion dynamics of the quagga mussel in Lake Balaton, Central Europe	**Chair: Rui Rebelo, Joaquim Reis**	SESS#5 **Francisco Godinho** Influence of the gudgeon *Gobio lozanoi* on native fish assemblages in a highly regulated Iberian river basin
11:30		SESS#2 **Manuela Abelho** Invasion of a small peri-urban stream by the exotic New Zealand mud snail		SESS#3 **Jesús M. Castillo** Impacts of Iris pseudacorus invasion on the abundance of macrophyte species in tidal wetlands		SESS#5 **Julien C. Piquet** How does the impact of an invasive snake cascades down to arthropod communities?
11:45		SESS#2 **Sofia Duarte** NIS-DNA: Early detection and monitoring of non-indigenous species (NIS) in coastal ecosystems based on high-throughput sequencing (HTS) tools		SESS#3 **Juan Sempere-Valverde** Before the crescendo: Baseline assessment of fouling communities in Red Sea NEOM, NW Saudi Arabia, before coastal development and urbanization		SESS#5 **Marek Šmejkal** Competitive exclusion of native species by invasive conspecific within *Carassius genus*
12:00		SESS#2 **Maarten Vanhove** Parasitic monogenean flatworms as tags for invasive aquatic vertebrates in Africa, using mitochondrial markers and historical collections		SESS#3 **Bethany Bradley** Observed and Potential Range Shifts of Native and Non-Native Species with Climate Change		SESS#5 **Sandra Hudina** Host-related traits influence the microbial diversity of the invasive signal crayfish
12:15		LUNCH & POSTER SESSIONS C6 (SESSIONS 3 AND 5)				

THURSDAY SEPTEMBER 5TH

		C3 ROOM A	C3 ROOM B	C3 ROOM C
14:00			KEYNOTE by César Capinha Insights, challenges and opportunities in the global mapping of biological invasions	
14:30	Chair: Emili García-Berthou, Joana Robalo	SESS#2 Janine P. da Silva The role of non-native species on river bioassessment	SESS#3 Rashmi Paudel Plants that have naturalized as aliens abroad have also become more common at home during the anthropocene	SESS#5 Martin Hejda The impact of invasive alien plants on riparian vegetation in Kruger National Park
14:45		SESS#2 Mar Leza Early detection tools for invasive insect species on Mediterranean islands: the case of Invasapp	SESS#3 Sven Bacher Global impacts to nature, nature's contributions to people and good quality of life from the IPBES assessment on invasive alien species	SESS#5 Ricardo Rocha Spatio-temporal dynamics and trophic ecology of free-ranging cats on a subtropical oceanic island
15:00		SESS#2 Ana Rodrigues Using DNA Metabarcoding for the Early Detection of Non-Indigenous Marine Macroalgae in Portuguese Recreational Marinas	SESS#3 Wayne Dawson When glaciers retreat, invaders advance: the spread of introduced plants and invertebrates on the island of South Georgia	SESS#5 Michal Janáč Newly constructed small water bodies in agricultural landscape: from biodiversity support to reservoir of non-native species
15:15		SESS#2 Eduardo Arlé Global multi-taxa assessment of the adequacy of alien species occurrence data	SESS#3 Franz Essl A new perspective on the biogeography and macroecology of biological invasions in the Anthropocene	SESS#5 E Alice Misuri vidence of short-term response of rocky cliffs vegetation after removal of invasive alien *Carpobrotus* spp. within the Life Project LETSGO GIGLIO
15:30	Chair: Nuria Roura-Pascual, Rui Rivaes	SESS#2 Pablo González-Moreno Citizen science platforms can effectively support early detection of invasive alien species according to species traits	SESS#3 Peter M. Kotanen Investigating current limits to plant invasions in northern Canada	SESS#6 Josef Kutlvašr Railways as a source of alien plants
15:45		SESS#2 Marie L. Davey Data driven horizon scanning: Leveraging 10 years of monitoring programs and genetic data to identify potential invaders to Norway	SESS#3 Margherita Gioria Linking the thermal response of seedlings of herbaceous species to naturalisation success	SESS#6 Gregory Egger Gravel-bed rivers in the southern hemisphere – a global hot spot for invasive plant species
16:00		SESS#2 Olaf Booy Invasive non-native species legislation requires inspection to be effective	SESS#3 Michelle Huebel Social-Ecological Network Modeling of Marine Fish Introductions in the Panama Canal	Chair: Jasmine Ferrario, Helena Trindade SESS#6 Christine S. Sheppard From novel to native: plant-soil feedbacks depend on functional traits and residence time
16:15		COFFEE BREAK C3		

THURSDAY SEPTEMBER 5TH

	C3 ROOM A	C3 ROOM B	C3 ROOM C
16:45	SESS#2 Raquel Queiroga Does fouling species selectivity works with/on plastics?	SESS#3 Laura A. Meyerson Indigenous Peoples Lands Harbor Fewer Invasive Species	SESS#6 Shu-ya Fan Plant naturalization is promoted by abiotic and biotic similarities but also by dissimilarities in evolutionary and anthropogenic histories between the native and non-native ranges
17:00	SESS#2 John Y. Dobson Dynamic modeling of Rugulopteryx okamurae: implications for ecological management and socio-economic impacts	SESS#3 Rebecca Pabst Database on the global human-mediated introduction of vector mosquitoes	SESS#6 Sabine Rech Invasive species dispersal on floating plastics in the Southeast Pacific: A comprehensive 3-year study of rafting in a temperate marine current system
17:15	SESS#2 Andrew Wannenburgh Surveying and monitoring the extent of terrestrial invasive alien plant taxa in South Africa	SESS#3 Raffaele de Giorgi Temperature affects Mediterranean-scale variations in trophic position and isotopic niche width of the invasive Atlantic blue crab *Callinectes sapidus*	SESS#6 Kamolphat Atsawawaranunt Diet adaptation and invasive success of the common myna, signals of selection revealed by genetics.
17:30	SESS#2 Andry Castro Large language models overcome the challenges of unstructured text data in ecology	SESS#3 Rocio Nieto Vilela Climate-driven range expansion: assessing *Siphonaria pectinata*'s response to rising temperatures	SESS#6 Felipe Espinoza Quantifying AS occurrences and their association to common invasion corridors in mainland Ecuador
17:45	SESS#2 Rafael Macêdo Validating Threshold Indicator Taxon Analysis for impact assessment of invasive species		SESS#6 Stefan Dehos Modeling and predicting the distribution and impact of the highly invasive freshwater jellyfish *Craspedacusta sowerbii* in the catchment of lake kinneret
18:00			SESS#6 Krzysztof Podwysocki Experimental assessment of the invasive potential of the two intraspecific lineages of the Ponto-Caspian amphipod - *Dikerogammarus villosus* (Crustacea: Amphipoda): does hybridization increase invasive potential?

Chair: Cátia Bartilotti, Mafalda Gama

Chair: César Capinha, Ana Novoa

Chair: Jan Pergl, Karolina Bącela-Spychalska

19:00 COCKTAIL & CONFERENCE DINNER — ACADEMY OF SCIENCES – RUA DA ACADEMIA DAS CIÊNCIAS, 19

FRIDAY SEPTEMBER 6TH

		C3 ROOM A	C3 ROOM B		C3 ROOM C
8:30			KEYNOTE by **Silvia Ziller** The role of science in decision-making on invasive species policy and management		
9:00		SESS#2 **Rein Brys** The power, challenges and integration of eDNA-based methods as a cornerstone for invasive species management	SESS#3 **Marta Florido** When *Rugulopteryx okamurae* arrives: Spatio-temporal Patterns Influencing Community Structure in Invaded Habitats		SESS#6 **Michal Gruntman** Shifts in dispersal traits of a heterocarpic plant across its invasion route
9:15	**Chair: Chiara Manfrin, Filipe Ribeiro**	SESS#2 **Jiří Skuhrovec** Platform NAJDI.JE: Citizen Science as a valuable multilevel tool for study of alien invertebrates	SESS#3 **Duo Chen** Effects of multiple global change drivers on invaded plant communities	**Chair: Greg Ruiz, Ronaldo Sousa**	SESS#6 **João Canning-Clode** Expanding the Horizons of DeNIS: A Global Database on Marine Debris and Non-Indigenous Species
9:30		SESS#2 **Joana Santana** Using invasion-only Ecological Niche Models for predicting the expansion of invasive species	SESS#3 **Giovanni Vimercati** Insularity and trophic position shape negative and positive impacts of alien ungulates on native biodiversity		SESS#6 **James Hardwick** Seed transport and landscape modelling to predict riparian plant invasion hotspots
9:45		SESS#2 **Theresa Henke** Let's talk aliens– Involving stakeholders in invasion science	SESS#3 **Gustavo A. Castellanos-Galindo** New fish introductions in a tropical lake could unleash interoceanic invasions in the Americas		SESS#6 **Luis Osorio-Olvera** Estimating invasion dynamics of *Cactoblastis cactorum* in North America
10:00		SESS#2 **Shevy Bat-Sheva Rothman** Lagging behind – what do we know about the parasitic fauna of alien fishes in the Mediterranean?	SESS#3 **Paride Balzani** Seasonal variability in the trophic ecology of three co-occurring invasive crayfish at a thermal locality	**Chair: Agnese Marchini, Paraskevi Karachle**	SESS#6 **Isabell Becker** Can *Solidago* spp. impede the establishment of a riparian forest on a restored river section? – Findings from the vegetation monitoring at the Lower Traisen River (Austria)
10:15		SESS#2 **Simone Guareschi** Using long-term biomonitoring data in invasion science: the case of riverine macroinvertebrate communities' invasibility	SESS#3 **Laís Carneiro** Scoring the impact types of biological invasions		SESS#6 **Jan Čuda** Winners and losers: short-term dynamics of alien species in the South African savanna in Kruger National Park
10:30		COFFEE BREAK C3			

FRIDAY SEPTEMBER 6TH

		C3 ROOM A		C3 ROOM B		C3 ROOM C
11:00	Chair: Guillaume Latombe, Ana Filipa Filipe	SESS#2 **Paula Moretti** Monitoring non-indigenous mobile species in port habitats using a standardized American protocol	Chair: Montserrat Vilà, Pedro Anastácio	SESS#3 **Ángela Rodríguez Ruiz** Embryonic Thermal Tolerance: A Bottleneck for invasive or native species?	Chair: Joaquim Sande Silva, Maarten Vanhove	SESS#6 **Nicole Kinlock** Naturalization of ornamental plants in the United States depends on cultivation and historical land-cover context
11:15		SESS#2 **Felipe Espinoza** New protocol to analyze alien species per-unit-effects and their response to socio-economic and environmental variables		SESS#3 **Franck Courchamp** Quantifying the magnitude of biological invasions using total biomass		SESS#6 **Jasmine Ferrario** Assessment of the level of spread of alien fouling species from ports to nearby areas
11:30		SESS#2 **Arnaud Monty** Four years of early warning and rapid eradication of common ragweed using citizen science: where are we now?		SESS#3 **Sara Roje** River warming and predation pressure out-turn on growth and survival of native and alien freshwater gammarid species		SESS#6 **Eléna Manfrini** Biological invasion risks from farming insect for food
11:45		SESS#2 **Thiago Cesar Lima Silveira** Integrating habitat models and monitoring for sun coral control in a marine protected area in southern brazil		SESS#3 **Tom Vorstenbosch** The shrubification of the Antarctic: Increases in invasive woody plant species under climate change on islands in the Southern Ocean		SESS#6 **Md Khurshid Alam Bhuiyan** Shifting Dynamics in the Bay of Cadiz: Can the Native Green Crab Withstand the Blue Crab Invasion?
12:00		SESS#2 **Joana R. Vicente** A review of scenarios and models of biological invasions under the IPBES IAS assessment				SESS#6 **Roseli Pellens** Dynamics of introduction alien fauna in New Caledonia
12:15		LUNCH & POSTER SESSIONS C6 (SESSIONS 2 AND 6)				

FRIDAY SEPTEMBER 6TH

		C3 ROOM A		C3 ROOM B		C3 ROOM C
14:00				KEYNOTE by **Gregory Ruiz** Assessing effects of policy on ship-mediated invasions in marine ecosystems		
14:30	Chair: Frances Lucy, Pietro Volta	SESS#4 **Frederico Carvalho** Ecosystem services and disservices provided by an invasive species – the case study of the manila clam in the tagus estuary	Chair: Helen Roy, João Canning-Clode	SESS#3 **Pilar Castro-Díez** Worldwide comparison of carbon pools and fluxes between coexisting native and non-native tree stands	Chair: Manuela Abelho, Michal Janáč	SESS#6 **Sven Jelaska** From Down Under to all over the Europe – first century of Devil's fingers (*Clathrus archeri*), an alien fungus presence on the continent
14:45		SESS#4 **Fiona S. Rickowski** Social-ecological networks and biological invasions: A case study of the invasive American mink in Iceland		SESS#3 **Dávid U. Nagy** Initial findings from the integrative CONyza NEtwork for Contemporary Trait evolution (iCONNECT)		SESS#6 **Hanno Seebens** Predicting the next alien species – an impossible task?
15:00		SESS#4 **Francisco J. Oficialdegui** Burgeoning non-native species production hinders sustainable aquaculture		SESS#3 **Florencia A. Yannelli** Unraveling invasion success: A causal-network approach to linking major hypotheses in the field		SESS#6 **Jean-Nicolas Beisel** Exotic and invasive invertebrates in Europe's freshwaters: a pan-European overview
15:15		SESS#4 **Luís Reino** Long-term Impacts of the EU trade ban in the wildlife trade network		SESS#3 **Jonathan Jeschke** Building an open atlas of knowledge for invasion science and beyond: key results of the enKORE project in the Hi Knowledge initiative		SESS#6 **Péter Takács** Non-native fish in Hungarian waters, historical overview and recent trends in their distribution
15:30		SESS#4 **Martina Sychrová** Effects of historical land cover, environmental and anthropogenic factors on invasions by alien plants in the Czech Republic		SESS#3 **Łukasz Jermacz** Are the days of native species numbered? - Effects of global warming on the functional response of native European bullhead and invasive racer goby		SESS#6 **Filipe Banha** Time matters in fish invasions! Short window of anglers' engagement in control actions
15:45		SESS#4 **Janeide Padilha** Uniting Science and Local Communities Efforts to Address the Signal Crayfish (*Pacifastacus leniusculus*) Threat in Montesinho Park		SESS#3 **Alessandra Kortz** Plant invasions in habitats across the globe: adding the missing piece to the macroecological mosaic		SESS#6 **Philip Hulme** Networks of risk: international tourists as a biosecurity pathway into national parks
16:00		SESS#6 **Zuzanna Plichta** Experimental evaluation of habitat preferences of invasive crayfish species in Europe		SESS#3 **Fabio Marcolin** Filling the urban niche: assessing Darwin's naturalization conundrum on invaded Italian bird communities		
16:15		COFFEE BREAK C3				

FRIDAY SEPTEMBER 6TH

		C3 ROOM A		C3 ROOM B		C3 ROOM C
16:45		SESS#6 **Matthew Fertakos** Propagule pressure from historic U.S. plant sales explains establishment, but not invasion		SESS#3 **Adrián García-Rodríguez** The global environmental impacts of invasive alien chytrid fungi on amphibians		SESS#6 **Cristina Lima** Unraveling the *Fire-Acacia dealbata* Puzzle in Portuguese Ecosystems
17:00	Chair: **Wolfgang Rabitsch, Janine Silva**	SESS#6 **Carol Melody** The Story of an Introduced Soil Dweller in the Changing Climate of Ireland	Chair: **Hélia Marchante, Sílvia Ziller**	SESS#3 **Brenda J. Grewell** Rapid invasive spread of Alternanthera philoxeroides in tidal wetlands: stress tolerance and escape strategies counter salinity stress with sea level rise	Chair: **Hanno Seebens, Franz Essl**	SESS#6 **Andrea Z. Botelho** Shipping and species Introductions: The Azores as a Crucial Hub in Atlantic Marine Ecosystems
17:15		SESS#6 **Josie South** Complex selection processes pushing the redclaw crayfish invasion front in the Zambezi Floodplains Ecoregion		SESS#3 **Jonatan Rodríguez** Invasive plant mats in riparian zones: a threat to soil microbial functional diversity and carbon and nitrogen stocks?		SESS#6 **Maurizio Bagnara** A new tool to predict the spread of alien species between any two points worldwide through human transport on land and water
17:30		SESS#6 **Mateusz Augustyniak** Public information use in invaded aquatic communities – are invasive demersal fish species more effective than natives?		SESS#3 **Paride Balzani** Potential distribution, observed impacts, and invasion risk of two non-native snapping turtles, Chelydra serpentina and Macrochelys temminckii		SESS#6 **Chiara Montagnani** Invasive alien plants in the city: where do "metropolitan aliens" like to be?
17:45		SESS#6 **Arnaud Jacobs** Challenges of delivering scientific advice for evidence-based policies on invasive alien species in Belgium		SESS#3 **Jarosław Kobak** Is the enemy of your enemy another enemy of yours? The quagga mussel replaces the zebra mussel in invaded areas: how and with what consequences?		SESS#6 **Maria Yu. Tkachenko** Distribution and host range of Neoergasilus japonicus (Ergasilidae), a highly invasive parasitic copepod
18:00				CLOSING CEREMONY		
18:30				END		

POSTER SESSION PROGRAM OVERVIEW

Poster Display Duration:

All posters will be displayed from September 4 to 6, with the option to set them up on September 3 during conference secretariat hours.

Poster Session Details:

Location: C6 Building
Time: 12:15 to 13:55 during lunch hours

Poster presenters are encouraged to be present by their posters during their respective sessions. The lunch and poster areas are combined, ensuring that poster presenters do not miss lunch while engaging with attendees. We recommend including a photo of yourself and a QR code on your poster, linking to a PDF of your poster or a 3-minute video presentation.

POSTER SESSIONS SCHEDULE:

Day 1: Wednesday, September 4

Session 1:
Risk Assessment and Management of Invasive Species
Session 4:
Socioeconomic Impacts of Invasions

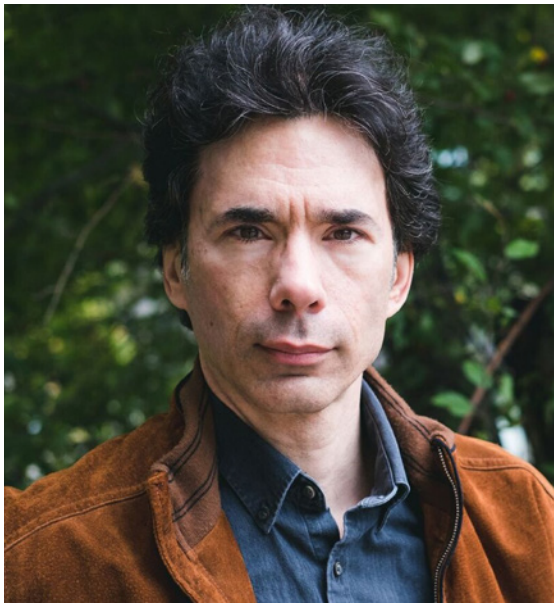
Day 2: Thursday, September 5

Session 5:
Conservation Issues and Biological Invasions
Session 3:
Global Change and Invasions

Day 3: Friday, September 6

Session 2:
New Tools and Approaches for Detection and Monitoring
Session 6:
Pathways and Dispersal of Invasive Species

KEYNOTE SPEAKER DESCRIPTIONS



ANTHONY RICCIARDI

Tony holds a James McGill Professorship at McGill University (Montreal, Canada). For over 30 years, his research has focused on how biological invasions alter biodiversity and species interactions. Using aquatic animal communities as model systems, he and his students conduct experiments in the lab and in the field to test the impacts of invaders under different environmental contexts. Through these studies, he aims to develop a predictive understanding of how invader impacts vary across space and time. Currently, his lab is examining the influence of climate warming on trophic interactions of non-native fishes and invertebrates in the Great Lakes-St. Lawrence River basin. Tony is one of the authors of the IPBES Invasive Alien Species Assessment and he has served on the editorial boards of the Journal of Animal Ecology, Diversity & Distributions, Biological Invasions, and NeoBiota.

NURIA ROURA PASCUAL

Núria is an environmental scientist at the University of Girona (Catalonia) with interests in understanding the ecology and distribution of invasive alien species, particularly social terrestrial insects, and providing effective solutions for their management. Through a combination of field observations, quantitative modelling, participatory discussions and, more recently, scenario analysis, she has developed an in-depth understanding of how biological invasions work and the different tools available for their management. During her involvement in the AlienScenarios project (2019-2022), in collaboration with the sister project InvasiBES, she contributed to the creation of future scenarios for biological invasions and the development of a guiding framework for the long-term management of biological invasions in Europe.

ELENA TRICARICO

Elena, a research fellow in Zoology at the University of Florence (Italy), works on conservation and invasion biology in aquatic environments, spanning from research on impacts and behavior to management and citizen science. She was also involved in the IPBES Invasives Alien Species Assessment. Elena is a member of the EASIN editorial board, of the Executive Committee and International Council International Association for Open Knowledge on Invasive Alien Species (INVASIVESNET), and of the EICAT Authority. She provides technical and scientific support for the implementation of EU Regulation 1143/2014 on IAS through IUCN, and participates in projects dealing with horizon scanning and risk assessment at EU level, as well as in education and dissemination activities with stakeholders and the general public on invasion biology.

CÉSAR CAPINHA

César is an Assistant Professor at the University of Lisbon (IGOT, UL). His research has mainly focused on mapping and analysing biogeographical changes caused by the human-mediated dispersal of species, often from a global perspective. Additionally, he has investigated the spatial and temporal predictive modelling of ecological and biological phenomena, with a particular emphasis on the spread, distribution, and phenology of non-native species. César often addresses these research topics using recent advances in machine learning and deep learning, aiming to incorporate developments from these tools into the invasion science toolbox. César is an integrated researcher at the Centre for Geographical Studies of the University of Lisbon and serves as Thematic Line Coordinator of the national Associate Laboratory TERRA. At IGOT, UL, he also leads BIOCHANGE, a team of young researchers dedicated to the study of biogeographical changes, with a focus on biological invasions, climate change, and land use dynamics.

SILVIA ZILLER

Silvia Ziller has been working on invasive alien species management and policy for more than 20 years in Brazil and throughout Latin America. She has a degree in Forestry and a Doctorate degree on biological invasions at the Federal University of Paraná in Brazil. Having finished her Doctorate studies, she became a Fellow of the Ashoka Social Entrepreneurs network and founded The Horus Institute for Environmental Conservation and Development in 2002, a not-for-profit organization, in order to assist governments and private companies in dealing with invasive alien species. In 2005 The Horus Institute and the Universidad Nacional del Sur in Argentina launched a standard invasive alien species database that is now available in three languages in nine countries in Latin America and the Caribbean. Silvia has supported the establishment of invasive species management programs in several states in Brazil, developed policy work for Ministries of Environment in several countries, helped draft official invasive species lists and regulations for the use of invasive species in several states, and adjusted risk assessment protocols for use in Brazil. Training people for practical invasive species management is another important front of the Horus Institute, as well as executing restoration projects that involve the clearing of invasive alien plants. Research partnerships often result in scientific publications that are used to foster work with governmental agencies. To learn more please go to www.institutohorus.org.br.

GREGORY RUIZ

Greg is a marine ecologist with active research interests in invasion biology, biogeography, and ecology in coastal marine ecosystems. He heads a research group of ~ 40 full-time biologists, based at the Smithsonian Environmental Research Center (SERC) laboratories, located on Chesapeake Bay and San Francisco Bay. Most of his research explores the patterns, mechanisms, and consequences of marine invasions at multipleat a multiple spatial and temporal scales. He conducts extensive comparative measurements and experiments among estuaries along the Pacific and Atlantic coasts for North America. A Senior Scientist at SERC for over 30 years, Greg also is a Research Professor and founding co-director of the Aquatic BioInvasion Research and Policy Institute at Portland State University. Greg has published over 200 scientific articles as author or coauthor, focusing primarily on marine invasion ecology and management. He began his career in California and has broad interests in marine biology and dynamics of coastal ecosystems. Greg holds a Ph.D. in zoology from University of California, Berkeley and a B.A. in aquatic biology from the University of California, Santa Barbara. For additional information visit SERC's Marine Invasion Research Laboratory website at http://invasions.si.edu/.

KEYNOTE ABSTRACTS

ANTHONY RICCIARDI

DO UNCONTROLLED INVASION RATES THREATEN ECOSYSTEM SUSTAINABILITY?

Biological invasions are rarely described as a sustainability issue. However, multiple lines of evidence from freshwater and terrestrial systems suggest that increasing invasion rates cause ecosystem functions and services to be less sustainable and less predictable over time. First, field data show that as the number of established non-native species ('invaders') in an ecosystem increases, so does the likelihood that at least one of them will cause an ecological disruption. Furthermore, a change in environmental conditions can trigger an initially innocuous invader to become disruptive long after its establishment; thus, invasions can have impacts deferred into the future. Finally, theory suggests that colonization pressure (the number of species introduced) can cause ecosystems to become more easily invaded and transformed through self-reinforcing feedbacks, resulting in an accumulation of invaders and their impacts—a process known as invasional meltdown. Therefore, while typically only a small proportion of invaders is disruptive, chronic colonization pressure could cause ecosystems to become increasingly difficult to manage sustainably. This concept implies that even a small reduction in the invasion rate will yield disproportionate benefits. In the Great Lakes, the world's most invaded freshwater ecosystem, ballast water regulation has apparently reduced the rate of invasion to an unprecedented low level. This successful case offers hope that the challenge of controlling invasion rates can be met by application of science-based solutions developed through collaborative efforts of stakeholders.

NURIA ROURA PASCUAL

SETTING THE COURSE FOR THE FUTURE MANAGEMENT OF BIOLOGICAL INVASIONS IN EUROPE

The future trajectories of biological invasions are highly uncertain, influenced by a multitude of socio-ecological drivers. Employing a scenario-based approach, we explored potential management options for invasive species in Europe. Initially, we formulated a comprehensive strategy comprising 19 goals related to invasive alien species issues that extend beyond mere management considerations. We then examined the strengths and weaknesses of each goal across various scenarios, proposing recommendations to enhance its overall applicability. The analysis identified four interrelated recommendations that should form the foundation of any long-term strategy for managing biological invasions. These are: (i) the establishment of a European biosecurity regime, (ii) the implementation of a dedicated communication strategy, (iii) the adoption of data standardization and management tools, and (iv) the creation of a monitoring and assessment system. Finally, the feasibility of the management strategy was evaluated, revealing varying degrees of challenge under different scenarios. The findings indicate that high levels of technological development, increased public environmental awareness, and the effectiveness of IAS policies facilitate the implementation of the management strategy. Together, these results suggest that it is time for a new approach to managing biological invasions based on an integrative approach across socio-economic sectors and countries.

ELENA TRICARICO

HOW CITIZEN SCIENCE EMPOWERS PEOPLE TO TACKLE BIOLOGICAL INVASIONS

Citizen Science (CS) is growing in popularity, reaching new audiences and areas of interest, and proving to have successful applications also in the field of invasion biology. Engaging citizen scientists into spotting, reporting and understanding alien species is indeed crucial for increasing awareness on biological invasions as well as promoting early warning and rapid response activities, control programmes at various spatial scales, and policy implementation. Data collected by citizens can be integrated with those produced by scientists for updating species distribution, long term monitoring, reconstructing invasion history and predicting invasion risk. A survey conducted at European level showed that many CS projects and initiatives on alien species are contributory and are run at a national scale, targeting the general public, alien plants and insects, and terrestrial ecosystems, with the main aim of mapping species presence and spread. The potential of CS in reporting species interactions and management outputs is currently underexplored, as many projects focus on one or few species, while it could provide a great contribution to better understand the impacts of alien species and the success of control activities. Moreover, CS can be very challenging in aquatic environments for the difficulty to spot species. However, thanks also to technologies, citizens are becoming more and more involved in discovering and reporting aquatic invaders, enhancing the possibility of prompt management actions. Despite some limitations, untapping and fostering CS potentialities, and strengthening the partnership between citizens and scientists would increase our capability to tackle biological invasions.

CÉSAR CAPINHA

INSIGHTS, CHALLENGES AND OPPORTUNITIES IN THE GLOBAL MAPPING OF BIOLOGICAL INVASIONS.

Over the past decade, significant efforts have been made to map biological invasions globally. These efforts have been instrumental for a range of fundamental and applied purposes, such as identifying drivers behind observed distributions, analysing temporal trends of introductions, assessing impacts on biodiversity and biogeographical patterns, and identifying traits of likely invaders. Despite the importance of the mapping efforts, identifying, collecting, and integrating alien species distribution data remains highly challenging. Key obstacles include the fragmentation of data sources, the widespread use of unstructured data types for species reporting, inconsistent terminology, and significant data gaps in many regions. These issues are severely hindering the assembly of comprehensive global distribution databases on invasions, demanding substantial human and technical resources to address. However, amidst these challenges, recent scientific and technological developments offer promising avenues for improvement. These include coordinated efforts by researchers to standardize and centralize alien species distribution data, the capabilities of advanced AI-based models to handle unstructured data effectively, and the availability of large volumes of data to train computational tools supporting species detection in the field. In my talk, I will review recent insights from global invasion mapping, discuss persistent challenges, and highlight emerging opportunities, drawing mainly from our previous and ongoing research. Harnessing these opportunities could significantly enhance our ability to tackle the complexities of biological invasions and improve global data integration efforts.

SILVIA ZILLER

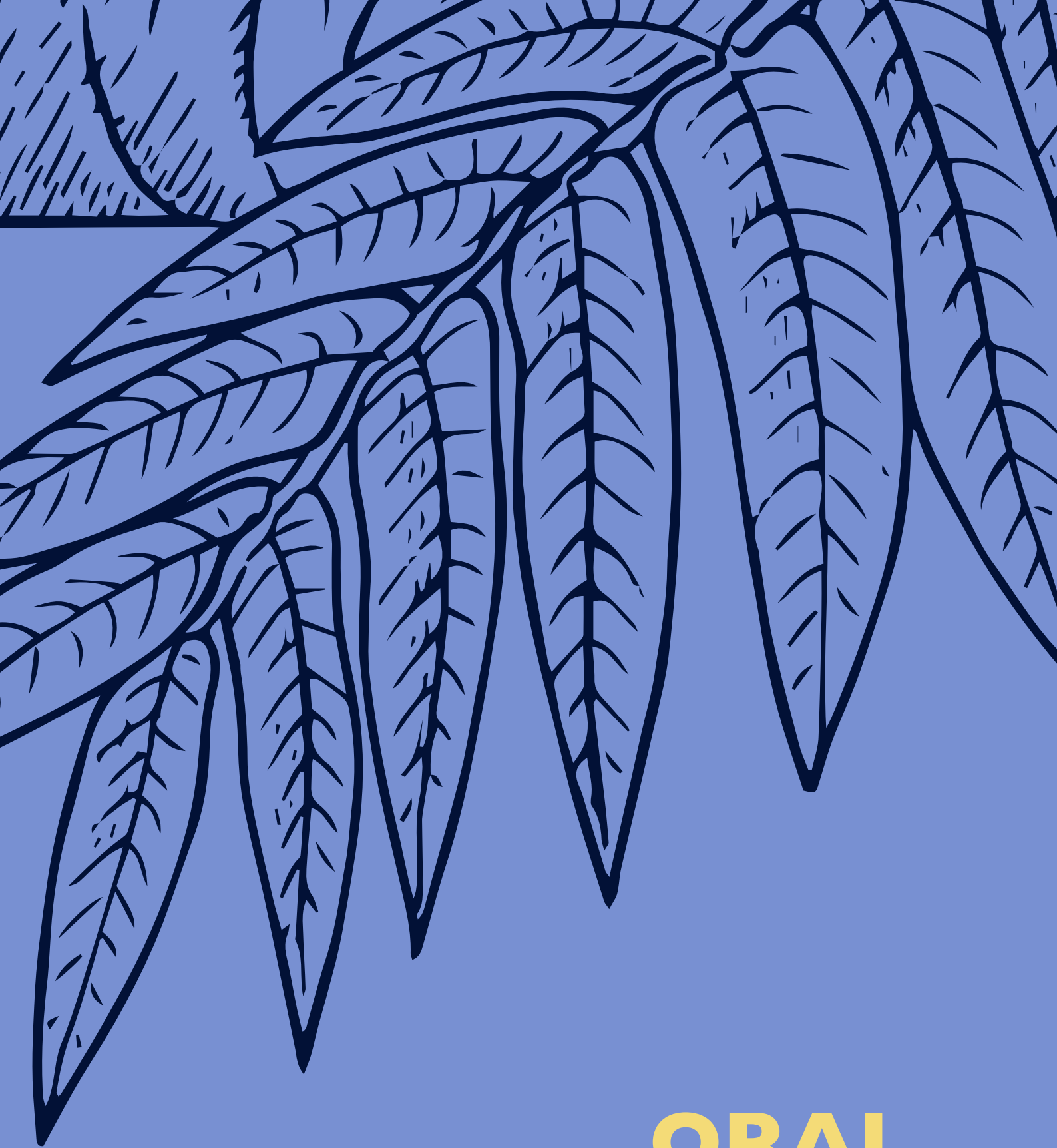
THE ROLE OF SCIENCE IN DECISION-MAKING ON INVASIVE SPECIES POLICY AND MANAGEMENT

Invasive alien species are a pernicious threat to native species, ecosystem services, the economy, and human health. Concerted efforts involving governments, civil society and private sectors are necessary to deal with this complex problem. In many countries, as in Brazil, there is no long-term experience in the management of invasive alien species, which implies the need to improve existing policies and regulations, and creates risk of investment in problems that cannot be solved or in initiatives that are later abandoned for lack of continued funding, generating bad references on invasive species control. In this scenario, science is key for informing decision-making both in terms of policy and management. The Brazil national invasive alien species database, a not-for-profit platform based on contributions by scientists and managers, online since 2005, has been used to guide the development of invasive species lists in one third of the 26 Brazilian states so far. Listing species has arisen conflicts of interest with several private sectors that use invasive alien species, especially in aquaculture, forestry, and agriculture. Therefore, solid information is required before species can be listed, involving knowledge on taxonomy, points of occurrence, potential or realized impacts, and management alternatives. The development and adoption of risk assessment protocols also require scientific backing and expert knowledge. Once lists are published, regulations have to be developed for listed species, with a priority to those of commercial use in order to contain spread and enforce control. Providing alternatives both on the part of species, for replacement, on management, and on procedures for restricted usage, must be a key issue in research, as prohibiting the use of species is rarely viable without a satisfactory alternative. Which indigenous species can be bred in different regions instead of Nile tilapia, and how? Which indigenous species in different ecosystems can replace ornamental plants that become invasive, and what treatments are needed for seeds to germinate? Can we produce wood from plantations of indigenous trees that have more value than worldwide distributed pines and gums? How can indigenous tree species be improved to satisfy the forestry industry? The gap between policy makers, field managers, and science can be narrowed with stronger collaboration from scientists with local and national governments. Third sector organizations are often a link between policy makers and academia, bridging information gaps for use in policy and management.

GREGORY RUIZ

ASSESSING EFFECTS OF POLICY ON SHIP-MEDIATED INVASIONS IN MARINE ECOSYSTEMS

Global trade is driven by commercial ships, which connect ports across a vast transportation network and are a dominant vector of invasions in coastal marine ecosystems worldwide. Over the past 30 years, biosecurity policies have advanced at national and international levels to reduce transfers and invasion risk of coastal organisms by ships, focused especially on treatment of ballast water (BW) with a similar process underway for biofouling of vessel hulls. We evaluated the current state of knowledge on effects of this biosecurity policy on (a) implementation of BW management practices, (b) magnitude of biotic transfers, and (c) invasion dynamics. Long-term data from the US National Ballast Information Clearinghouse demonstrates extensive uptake of BW treatment, with most BW discharge (>400 million m^3 per year to US coastal waters) being treated. It's clear that the global fleet has undergone a remarkable shift in management of BW with increasing standards, accelerating in the past decade, and this has certainly reduced associated concentrations of organisms. Moreover, available literature syntheses suggest detection rates of new invasions have declined in recent years. Yet, the residual risk and ultimate effect of current biosecurity on invasion dynamics remains largely unresolved, due to limitations of available data and expected lag times in detection. Establishing standardized and quantitative field-based measures, repeated over time at selected "sentinel sites", is critically needed to address this knowledge gap and provide a robust, statistical approach to evaluate and inform vector management.



ORAL PRESENTATION ABSTRACTS

Session 1 – Risk assessment and management of invasive species

PRIORITISATION FRAMEWORKS TO GUIDE IAS MANAGEMENT DECISION MAKING AT MULTIPLE SCALES

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A strategic prioritised approach to invasive species management is required, there are more Invasive Non-native Species to manage than there is resource available. Frameworks and toolkits have been used to help guide global and national priorities. However, there can be mismatches between national priorities for prevention and eradication and the species that challenge management efforts at a regional or site level. At subnational levels, limited resources are often spent on ongoing control of abundant, widespread and long-established species at scales that make little impact. We demonstrate how prioritisation processes can be applied to provide land managers valuable spatially attributed information to inform decision making and more effective allocation of scarce resources.

As a case study in the EU Life WADER project we assessed all invasive plants species in a designated dune system in the north of England using extant species information from a range of published sources. An assessment workshop with land managers, local recorders and botanists allowed scoring of species impact (using modified EICAT classification) and spread potential and feasibility of suitable management measures to be assessed and discussed to derive a prioritised list of species for local eradication. This list included species that were being overlooked by current management. A simple and quick prioritisation process can also highlight feasible cost-effective invasive species management actions, beyond on-going control. We encourage managers responsible for sub-national jurisdictions, which often include protected areas, national nature reserves or designated sites, to also prioritise species action to consider both impacts and management feasibility

Session 5 – Conservation issues and biological invasions

DIVERSITY OF BENTHIC COMMUNITIES AFTER 15 YEARS OF INVASION OF *DIDYMOSPHENIA GEMINATA* IN PATAGONIAN RIVERS

Alejandra Oyanedel[1], Rodrigo Jaramillo[1], David Opazo[1], Mario Ortiz[1], Paula Ramírez[1]
1- División de Acuicultura, Instituto de Fomento Pesquero

The invasive diatom *Didymosphenia geminata*, commonly called Didymo or rock snot, was detected for the first time in Chilean rivers in 2010. Due to its high invasiveness, its known effects as an ecosystem engineering species and the possible economic effects, the Government of Chile executes a permanent monitoring of this species. The current geographical distribution of Didymo covers a latitudinal range of 2500 km (35°-55°S). The effect of Didymo on benthic communities in rivers in Patagonia was evaluated, incorporating sampling events between 2016 and 2022. Sites without Didymo and sites with different levels of Didymo density in shallow running water habitats were identified. We worked based on a matrix consisting of 130 taxa of macroinvertebrates, 160 taxa of periphyton, 430 species of diatoms, and 22 environmental variables. The results showed that the turnover of microalgae and macroinvertebrate species decreased significantly and sustainably as Didymo cell density increased. The sites where a higher density of Didymo was recorded had a lower concentration of total phosphorus, total nitrogen, conductivity and temperature, but a higher concentration of calcium. In the case of macroinvertebrates, an alteration was observed in the proportion of trophic functional groups, with an increase in the abundance of snails (Chilina), dipterans (Chironomidae) and amphipods (Hyalella). The use of multivariate diversity indices allows us to highlight that the communities invaded by Didymo should have a tendency towards homogenization on a regional scale. A river classification based on the results shown should allow institutions to focus efforts on the management of Didymo in Chile.
This study was funded by the Undersecretariat for Fisheries and Aquaculture, Ministry of Economy, Chile.

Session 5 – Conservation issues and biological invasions

THE INVASION BY *RUGULOPTERYX OKAMURAE* IN A BARREN-STATE DOMINATED COAST LEADS A PHASE-SHIFT IN ROCKY COASTAL SYSTEMS

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After the arrival and proliferation of *Rugulopteryx okamurae* in the Açores archipelago, the spread of this species continued in the Macaronesian Region, being reported in Madeira archipelago in December 2021. The first risk assessment (AS-ISK) of this species in Madeira island, developed in early 2022, showed a medium-high risk of becoming invasive in the actual context and future climate change scenarios. Through diving surveys, with transects at 5m and 15m in 4 sites along the south coast of Madeira, we assessed the invasion process in Madeira Island. We evaluated changes in the benthic communities (algal cover-functional traits, species diversity, sea-urchins density) before (2021) and after (2023) the invasion by *R. okamurae*. Results showed how barrens dominated by sea urchins went from dominating all sites in 2021 to almost disappearing in 2023. Erect and turf algae are nowadays the most dominants functional groups in the south coast of Madeira. The main grazer, the sea-urchin *Diadema africanum* used to be abundant at 15 m depth (~7 ind./m^2), but we didn't find any individuals during 2023. Our results demonstrate the phase shift occurring in the coastal benthic systems of Madeira, influenced by the invasion of *R. okamurae* and the mass mortality of *D. Africanum* recorded in 2022. This study highlights the capacity of an invasive alga to colonize barrens and transform rocky coastal systems.

Session 3 – Global change and invasions

PLANT INVASIONS IN HABITATS ACROSS THE GLOBE: ADDING THE MISSING PIECE TO THE MACROECOLOGICAL MOSAIC

Alessandra Kortz[1], Martin Hejda[1], Josef Brůna[1], Jan Čuda[1], Desika Moodley[1], Ana Novoa[1,2], Jan Pergl[1], Pavel Pipek[1,3], Kateřina Štajerová[1], SynHab Contributors, Petr Pyšek[1,3]
1- Institute of Botany, Czech Academy of Sciences, Průhonice, Czech Republic; 2- Estación Experimental de Zonas Áridas (EEZA-CSIC), Almería, Spain; 3- Department of Ecology, Faculty of Science, Charles University, Prague, Czech Republic

Recent databases on alien species distributions enhanced our understanding of the factors determining the occurrence patterns of alien species around the globe. Despite awareness of their importance, the role of habitats remains poorly explored in invasion-focused macroecological studies. To overcome this constraint, we built the SynHab database (www.synhab.com), which summarizes data on naturalized and invasive plant species distributions in 12 habitat categories applicable to all world regions. The SynHab database contains 102 datasets from all continents at the country resolution. It includes ~ 7,018 plant taxa - thus covering habitat information for about 50% of the world's naturalized flora (GloNAF database, www.glonaf.com). Here, we show how levels of invasion in individual habitats differ by main continents and biomes and how they depend on climatic conditions, regional land use, and the invasion stage. We found that human-made and woody habitats generally harbour greater levels of naturalized species than other habitats, but there are continental and biome differences (e.g., as for stressed habitats in Australasia and the Mediterranean, grasslands in Africa, and woody habitats in tropical savannas). Differentiating between invasion stages (casual, naturalized, and invasive) brings about additional context, with invasive aliens exhibiting stronger habitat affiliations than naturalized ones. We demonstrate that novel insights can be yielded by considering that many species occur in multiple habitats, both in their native and invaded ranges, and that these habitat combinations generate outcomes different from single-habitat classifications. At the species level, analyses have shown that the species' habitat niche is closely associated with their global naturalization success, and the relationship differs by habitats and biomes. Taken together, our results indicate the potential of the SynHab database to test key hypotheses in invasion biology, increase our understanding of mechanisms acting in specific habitats, and make predictions about future invasions.

Session 5 – Conservation issues and biological invasions

EVIDENCE OF SHORT-TERM RESPONSE OF ROCKY CLIFFS VEGETATION AFTER REMOVAL OF INVASIVE ALIEN *CARPOBROTUS* SPP. WITHIN THE LIFE PROJECT LETSGO GIGLIO

Alice Misuri[1], Eugenia Siccardi[1], Michele Mugnai[1], Renato Benesperi[1], Francesca Giannini[2], Michele Giunti[3], Lorenzo Lazzaro[1]

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Invasive Alien Plant Species (IAPS) significantly alter natural ecosystems, making their eradication or control crucial for biodiversity conservation. *Carpobrotus acinaciformis* and *C. edulis*, with their hybrids, pose a significant threat in Mediterranean ecosystems, especially on small islands. We present the result of the actions to control the invasion of *Carpobrotus* spp. on Giglio Island (Tuscan Archipelago, Italy) within the LIFE project LETSGO GIGLIO.

This study analyzed the short-term changes in Carpobrotus spp. And native species presence and abundance during the action of control, mainly conducted by manual removal. Particularly the monitoring focused on two rocky cliffs habitats: 1240 Vegetated sea cliffs of the Mediterranean coasts with endemic Limonium spp. And 5320 Low formations of Euphorbia close to cliffs. Monitoring began in 2020 up to 2023, employing the Before-After-Control-Impact (BACI) methodology for impact assessment. The sampling included a total of 24 permanent plots, 12 for habitat, evenly distributed between invaded (subjected to the removal) and control plots (with no Carpobrotus spp.). The results indicate that two years after *Carpobrotus* spp. removal, native plant communities already showed a significant recovery towards pre-invasion species compositions. Diversity indices also improved, although the recolonization of the invaded areas by native species is strongly influenced by the amount of litter left in place after the intervention. Indeed, the initial stages of colonization favored nitrophilous species due to changes in soil features. The monitoring also highlighted an important emergence of seedlings of *Carpobrotus* spp. in the two years after the main intervention.

Our study highlights the effectiveness of manual removal in restoring native habitats already in the short term and underscores the importance of continuous monitoring to ensure long-term conservation success. Indeed, the project foresees continuous monitoring for the years following the main intervention and several follow-up interventions to remove new seedlings.

Session 5 – Conservation issues and biological invasions

THE RISE OF NON-NATIVE SPECIES: CHARACTERIZING IBERIAN FRESHWATER FISH COMMUNITIES TO GUIDE CONSERVATION STRATEGIES

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1- Forest Research Centre (CEF), Associate Laboratory TERRA, School of Agriculture, University of Lisboa, Portugal; 2- MARE University of Coimbra, Portugal; 3- University of Seville, Spain

With the unprecedented rise of non-native fishes' establishment in the Iberian Peninsula it is now ripe to examine current biotic communities to address biodiversity loss. This study characterizes fish communities in the Iberian Peninsula using occurrence data from GBIF, Carta Piscícola Española, and scientific publications, combined with environmental and anthropogenic information. We compiled 302,390 occurrence records from 31,345 unique locations, covering 98 species and 300 environmental variables in a GIS-linked database. Overall, 44% of native species are endemic and 58% belong to the Cyprinid family. Since 1845, non-native fish species, mostly from Europe and Asia, have increased exponentially, now reaching 27 species. According to the latest IUCN global assessment, 44% of these species are at risk of extinction, with the Guadiana Basin hosting the highest concentration of endangered species, with many stream reaches having >5 species at risk of extinction. Our analyses indicate non-native species thrive in areas with higher human footprint. Restoring natural flow regimes and riverine habitats can favour native species over cosmopolitan, and often predator, non-native species. Nevertheless, preventing and controlling new introductions remains crucial for preserving Iberian fish communities.

Session 5 – Conservation issues and biological invasions

IMPACTS OF INVASIVE PLANTS ON SOIL AND ITS MICROBIAL COMMUNITIES IN RIVERINE HABITATS OF A SOUTH AFRICAN SAVANNA

Ana Novoa[1,2], Mara Loreto Castillo[2], Llewellyn C. Foxcroft[3,4], Luís González[5], Desika Mařík ová Moodley[2], Jan Čuda[2], Martin Hejda[2], Jaco Le Roux[4,6], Khensani Nkuna[3,4], Klára Pyšková[2,7], Petr Pyšek[2,7]

1- Czech Academy of Sciences, Institute of Botany, Department of Invasion Ecology, Průhonice, Czech Republic; 2- Estación Experimental de Zonas Áridas (EEZA-CSIC), Almería, Spain; 3- Scientific Services, South African National Parks, Private Bag X402, Skukuza 1350, South Africa; 4- Centre for Invasion Biology, Department of Botany and Zoology, Stellenbosch University, Private Bag X1, Matieland 7602, South Africa; 5- Plant Ecophysiology Group: Invasive plants, Department of Plant Biology and Soil Sciences, Universidade de Vigo, 36310, Vigo, Spain; 6 - School of Natural Sciences, Macquarie University, Sydney, NSW 2109, Australia; 7 - Department of Ecology, Faculty of Science, Charles University, Prague, Czech Republic

The number and magnitude of alien plant invasions in protected areas are increasing globally. In the Kruger National Park (KNP), South Africa, one of the world's most iconic and oldest protected areas, the presence of at least 58 naturalized and 21 invasive alien plant taxa has been documented. Among these, three annual plants native to the Americas (i.e., *Xanthium strumarium, Datura innoxia*, and *Parthenium hysterophorus*) form extensive dominant stands along the rivers during the wet season. Yet, it is unknown whether they have important negative environmental impacts. To shed light on their potential impacts on soil physicochemical characteristics and microbial communities within KNP, we identified seven populations of each invasive species throughout the park. We established a pair of invaded and uninvaded plots in each population, and in each plot (14 per species, total = 42), we collected five subsamples from the top 10 cm of soil and homogenized them into a single replicate. We then used these mixed soil samples to measure soil pH, humidity, nutrients (P, NO2-, NO3-, NH4+, and organic matter), enzymatic activities (glucosidase, urease, and phosphatase), and bacterial and fungal diversity. We found that the target invasive annual plants modified soil parameters and changed the composition of soil bacterial and fungal communities. These results provide new insights into the complex impacts of alien plants on soils in riparian habitats, with implications for other trophic levels, and contribute to identifying the priorities for invasive species management in KNP.

Session 1 – Risk assessment and management of invasive species

DEMYSTIFYING THE EU IAS REGULATION

Ana L. Nunes[1], Vittorio Bellotto[2], Katie E. Costello[1], Konstantin Gospodinov[2], Jose L. Postigo[2], Riccardo Scalera[3], Aurore Trottet[2], Tamryn Venter[1], Kevin G. Smith[1]
1- IUCN BAKT, Centre for Science and Knowledge, Cambridge, UK; 2- IUCN BAKT, Centre for Science and Knowledge, Brussels, Belgium; 3- IUCN SSC ISSG, Rome, Italy

Invasive alien species (IAS) are known to be one of the major drivers of biodiversity loss and species extinctions. As such, the European Union (EU) has committed to prevent, minimise and mitigate the adverse impacts from IAS upon native biodiversity and ecosystem services. In order to achieve this, the EU 2030 Biodiversity Strategy recognises the need to step up the implementation of EU Regulation 1143/2014 on the prevention and management of the introduction and spread of invasive alien species, which entered into force in January 2015. At the core of the Regulation is the list of IAS of Union concern, which currently includes 88 species (47 animals and 41 plants), for which special restrictions apply (such as a ban on keeping, importing, selling and breeding). The Regulation also requires each of the 27 EU Member States to develop and implement pathway action plans, establish surveillance systems for early detection of new species and manage IAS that are widely spread in their territories.
This presentation provides an overview of the Regulation and its key provisions. In addition, it showcases a range of resources produced by the International Union for Conservation of Nature (IUCN), together with collaborating experts, which main goal is to support and facilitate the implementation of the Regulation. These materials include species brochures, identification guides, case study compilations, management notes and other guidance documents, with a special focus on the 88 IAS of Union concern, and they can be used by national authorities, conservation practitioners, researchers and other stakeholders.

Session 2 – New tools and approaches for detection and monitoring

USING DNA METABARCODING FOR THE EARLY DETECTION OF NON-INDIGENOUS MARINE MACROALGAE IN PORTUGUESE RECREATIONAL MARINAS

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Environmental DNA (eDNA) based molecular tools have become increasingly valuable for identifying rare species and detecting non-indigenous species (NIS) in aquatic environments. However, macroalgae species are often either undetected or under-represented. Maritime traffic significantly contributes to the global introduction of NIS, with recreational marinas being key hubs for these introductions, including macroalgae species. In this study, 10 recreational marinas were sampled across mainland Portugal, the Azores, and Madeira archipelagos. Seawater, phytoplankton trawls, and bulk macroalgae samples were collected and analysed using metabarcoding with 18S and COI genes via high-throughput sequencing (HTS), without prior species identification. The obtained reads were identified to the lowest possible taxonomic level and compared to local species lists. Several macroalgae species, including NIS and potential NIS, were identified. Our findings highlight the effectiveness of metabarcoding for the early detection of macroalgae species, providing valuable information on the presence of macroalgae and potential NIS in Portuguese marinas.

Session: Session 1 – Risk assessment and management of invasive species

MAPPING THE SPATIAL DISTRIBUTION OF NON-INDIGENOUS INVERTEBRATES IN RECREATIONAL MARINAS ACROSS MAINLAND PORTUGAL AND ISLANDS THROUGH DNA METABARCODING

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Non-indigenous species (NIS), introduced primarily through shipping at marinas and ports, pose significant threats to coastal ecosystems, necessitating effective monitoring, prevention, and management strategies. This study aimed to assess the spatial variation of marine invertebrate fauna, particularly NIS, across 10 recreational marinas in Portugal (6 on the mainland – Viana do Castelo, Porto, Aveiro, and Lisbon - and 2 in each the Madeira and Azores archipelagos). Hard substrates, zooplankton, and water for eDNA analysis were collected at each location in June/July 2020, representing a total of 111 samples. We employed the mitochondrial cytochrome c oxidase subunit I (COI) and the small subunit 18S rRNA gene (18S), for DNA metabarcoding-based species detection using Illumina MiSeq sequencing and customized pipelines.
We detected 656 species in the marinas, of which 39 were identified as NIS, but only 13.3% of NIS were detected in all of them, and 8% were common to Madeira and the Azores. The Azores exhibited the highest species diversity, and Madeira the lowest. Similarly, Lisbon displayed the highest number of NIS, whereas the archipelagos had the lowest. A Principal Coordinate Analysis indicated distinct separation among communities forming three main groups: 1) communities from Viana do Castelo, Porto, and Aveiro (mainland); 2) communities from Lisbon (mainland); and 3) communities from Madeira and the Azores, which overlap with biogeographical areas previously identified in the marine realms. Analysis of NIS and potential new records is ongoing, but invasive species, such as the Chinese mitten crab (Eriocheir sinensis), were among those identified and detected in zooplankton in Viana and in hard substrates in Aveiro, contrasting with previous morphological assessments that recorded this species in Lisbon. This study will provide valuable insights into the distribution of NIS, document the marina's marine invertebrate fauna, and contribute to the detection of potential new records in Portuguese coastal ecosystems.

Session 2 – New tools and approaches for detection and monitoring

NIS-DNA: EARLY DETECTION AND MONITORING OF NON-INDIGENOUS SPECIES (NIS) IN COASTAL ECOSYSTEMS BASED ON HIGH-THROUGHPUT SEQUENCING (HTS) TOOLS

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The NIS-DNA project aimed to enhance the detection and monitoring of Non-Indigenous Species (NIS) in Portuguese coastal waters over a 4-year research period. Central to our mission was the development, optimization, and implementation of DNA-based tools, particularly HTS, for early detection of NIS. In Task 1, we addressed the crucial need for a reliable library of standard reference sequences (DNA barcodes) by identifying gaps in European reference libraries of NIS. We meticulously compiled, revised, and annotated barcodes belonging to marine invertebrate NIS. Out of the 1249 species compiled, approximately 42% had records on BOLD, with 56% of those being discordant. Through revision, we successfully resolved 35% of the 622 discordant BINs, leading to an increase in the detection of NIS in eDNA metabarcoding datasets from 12 to 16. Tasks 2 and 3 focused on evaluating the effects of different sample types, seasons, and spatial variation on NIS identification. Two comprehensive studies were conducted: first, assessing the impact of various eDNA substrates and seasons on NIS detection; second, conducting a national NIS distribution assessment across 10 recreational marinas along mainland Portugal, Madeira, and Azores archipelagos. By using Illumina MiSeq targeting COI and 18S-V4 genes, our analyses revealed seasonal variations, with spring and autumn exhibiting the highest species diversity and NIS counts. Taxonomic composition analysis highlighted differences in species richness and community structure among different substrates and sample types. Notably, no NIS were detected across all sample types or seasons. In the spatial assessment, we identified 656 marine invertebrate species, including 39 NIS, across the surveyed regions. Our findings underscore the need to employ diverse sample types and consider seasonal variation for a comprehensive metabarcoding-based surveillance of NIS in recreational marinas. This knowledge is invaluable for integrating DNA metabarcoding into national NIS surveys, thereby supporting the Marine Strategy Framework Directive (Task 4).

Session 1 – Risk assessment and management of invasive species

PRIORITIZING INVASIVE ALIEN SPECIES IN ITALY

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In the framework of the LIFE15 GIE/IT/001039 "Alien Species Awareness Program" (ASAP) project, an assessment was conducted to compile a ranked list of invasive alien species of national concern in accordance with the EU Regulation n. 1143/2014. Eighty experts were brought together to address five thematic groups of IAS: plants, marine species, vertebrates (excluding marine species), freshwater invertebrates, terrestrial invertebrates.
A total of 1,541 alien species were assessed, of which 878 were still absent in Italy (i.e.,unreported to date) and 673 were already present. The still absent species were selected according to the following criteria: (I) species with the highest probability of arrival, (II) species most traded as pets or for ornamental purposes, (III) species recognized as invasive worldwide and (IV) species already assessed in the horizon scanning at European level. We excluded from the overall assessment the species already present in Italy with a low impact on biodiversity.
The procedure was divided in three steps: 1) preliminary screening within the five groups to score each species taking into account several parameters (such as likelihood of arrival and establishment, potential impact on biodiversity, human activities and health as well, availability of prevention and management techniques); 2) consensus building among the groups to revise the scores; 3) development and application of the algorithms to rank the species. At the end of the process, considering five establishment/impacts classes and three manageability classes, the species were ranked into 4 priority classes. As candidates for inclusion in the list of national concern, experts identified a total of 187 species (110 still absent, 77 already present in Italy): 38 of them were classified at maximum priority level (15 absent and 23 present), 53 at high priority level and 96 at medium priority level.

Session 6 – Pathways and dispersal of invasive species

SHIPPING AND SPECIES INTRODUCTIONS: THE AZORES AS A CRUCIAL HUB IN ATLANTIC MARINE ECOSYSTEMS

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The Azores archipelago is a significant marine biodiversity hotspot, where northern, subtropical, and Mediterranean species co-exist, influenced by the region's unique biogeographic conditions. These characteristics arise from maritime currents and prevailing winds, facilitating natural dispersal and serving as a major route for sailing vessels from America, Africa, and Europe. This connectivity accelerates natural colonization and profoundly impacts marine ecosystems across the Atlantic. Maritime traffic, from commercial shipping to nautical tourism, acts as a primary vector for species introductions, via hull fouling and ballast water discharge. This process enables species to bypass distance and oceanographic barriers, altering benthic communities and promoting biotic homogenization throughout the Atlantic. Analyzing shipping data, such as port call frequency, last port of call, available berths, and the incidence of non-indigenous species (NIS) in Azorean marinas, provides critical insights into this pressure. Notably, the Caribbean represents a frequent source of maritime traffic to the Azores, previously centered on the westernmost Flores Island, now extending to other harbors with higher traffic volumes, due a partial inoperativeness of Flores port. Rising sea water temperatures is also contributing for the establishment of species that might rather naturally arrive transported by the prevailing gulf current and Atlantic circulation confounding the role of fouling in arrivals from the West. Nevertheless, examination of prevailing shipping routes between the Azores and both Atlantic shores is essential for understanding human-mediated connectivity and identifying invasion pathways as the Azores can act as an accelerator in dispersal to the W and recipient from fouling transported species from southern Atlantic archipelagos.

Session 2 – New tools and approaches for detection and monitoring

SURVEYING AND MONITORING THE EXTENT OF TERRESTRIAL INVASIVE ALIEN PLANT TAXA IN SOUTH AFRICA

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South Africa is an arid country with a mean annual rainfall of about 490 mm, only 9% of which ends up as water in rivers or aquifers. A recent survey of its most widespread and abundant, terrestrial invasive alien plant taxa found that estimated mean total flow reduction caused by invasive alien plants is about 3% of the naturalised mean annual runoff. We also found that while the extent of escaped commercial timber plantation taxa have increased in range and abundance by up to 22%, taxa under biocontrol have seen an 23% decrease in extent after 15 years. The latest survey data has also assisted us in setting realistic targets for our labour-intensive (public works) mechanical & chemical control interventions, targeting biocontrol releases, regulating compliance and utilizing biomass.

Session 2 – New tools and approaches for detection and monitoring

LARGE LANGUAGE MODELS OVERCOME THE CHALLENGES OF UNSTRUCTURED TEXT DATA IN ECOLOGY

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The volume of unstructured text data, as provided by research papers, online news, and social media, is increasing fast. This makes the ability to deal with these data increasingly relevant for ecological and invasion research, but also challenging due to the vast resources needed to identify and assimilate these data manually. Therefore, we tested the possibility of using three state-of-the-art large language models (LLMs) - ChatGPT 3.5, ChatGPT 4, and LLaMA-2-70B - to automate the identification, interpretation, extraction, and structuring of relevant invasion-related information from unstructured text data. Specifically, we applied a prompt-based approach and assessed the capacity of models in: 1) identifying the region(s) where invasive species are reported; 2) the geographical coordinates for these regions; 3) distinguishing relevant from non-relevant sources and 4) providing the information requested in a structured format. Our results show that ChatGPT 4 reaches a very good percentage of correct results, usually exceeding 90%. The two other models performed worse, but with performances still potentially useful in some circumstances. Model performances also appear dependent on the type of data source (with better results found from online news than research papers) and on the type of task performed (e.g., better results in identifying invaded regions and presenting data in a structured format). The integration of LLMs into data assimilation workflows, including in invasion science, appears not only imminent, but also essential to meet the growing challenge of efficiently processing the increasing volume of textual data.

Session 1 – Risk assessment and management of invasive species

PREVENTING INVASIVE SPECIES AND BEING PREPARED: HOW KEY OPTIONS IDENTIFIED BY THE IPBES ARE SOLVED IN NORWAY

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The transportation and introduction of alien species by human activities are causing the number of invasive alien species (IAS) worldwide to rise alarmingly fast. The IPBES concludes that preventing introductions, being prepared and rapid responses are key for successful management of IAS. Important actions are horizon scanning, pathway management and risk analysis of alien species. To date, a unified framework offering methods and tools for horizon scanning and risk assessment that incorporate pathway knowledge has largely been lacking. We developed a method for horizon scanning and systematically scanned over 3 400 alien species currently not reproducing outdoors in Norway – typically found in neighbouring countries or countries of similar bioclimatic conditions. We identified 753 new 'door knockers' for Norway, i.e. Alien species able to reproduce independently outdoors in Norway in the foreseeable future. These species were given a full risk assessment following the method Generic Ecological Impact Assessment of Alien Species including an evaluation of pathways for introduction and spread following the CBD categorization pathway scheme. Over 250 of the new door knockers have negative ecological effects and >60 % of these will also expand their distribution after introduction. Pathways of introduction were found to be mostly by natural dispersal across the border for terrestrial species, and via "hull fouling" for marine species. Climate change increases the negative ecological impact for almost half of the species. Results are available online in the Alien Species List of Norway 2023.

This is a unique investment that relates directly to the key options for successful management of IAS as identified by the IPBES. Our approach provides methods and tools for systematically assessing the impact of alien species. It adheres to international standards and is applicable for all species groups and in all regions. This makes it highly relevant for anyone engaged in alien species.

Session 3 – Global change and invasions

EMBRYONIC THERMAL TOLERANCE: A BOTTLENECK FOR INVASIVE OR NATIVE SPECIES?

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Studying thermal tolerance during embryonic development between a non-native and a native species can provide valuable insights into their potential responses to climate change. Eggs represent a vulnerable stage in the life cycle of organisms, and there exists a noticeable research gap regarding respiratory responses to thermal stress on embryos. By understanding how the embryonic development of these species responds to different temperature regimes, we can make predictions about their future population dynamics.

If invasive species exhibit greater thermal tolerance than natives do, they could gain a competitive edge under future temperature projections, potentially resulting in larger populations or broader distribution ranges.

The Respiratory Electron Transport System (ETS) activity was used in this study as an estimator of the thermal tolerance for brooding eggs in the invasive blue crab *Callinectes sapidus* and the native green crab *Carcinus maenas* in the Gulf of Cadiz. In a context of global warming and Marine Heat Waves, and based on the species' hatching thermal range, four experimental temperatures were used for *C. sapidus* (22, 24, 26, and 28°C) and three for *C. maenas* (10, 17 and 24°C) to compare ETS activity during embryonic development.

High temperatures resulted in increased ETS activity and early hatching of the eggs in both species (within each species' range); however, the optimal development temperature resulted in 24°C for *C. sapidus*, and below 17°C for *C. maenas*, in terms of ETS activity regime and larval viability. Besides, blue crab embryonic development exhibited a greater tolerance to temperatures above 24°C, while green crab did not complete development even at 24°C.

This suggests that an increase in water temperatures in a context of global warming may lead to heightened invasiveness of *C. sapidus*, expanding its range into other locations and affecting local populations of native species like *C. maenas*.

Session 3 – Global change and invasions

BIOGEOGRAPHICALLY NOVEL AND CO-XENIC NOVEL ASSOCIATIONS ARE COMMON IN ALIEN FUNGAL AND FUNGUS-LIKE PLANT PATHOGENS

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The spread of alien fungal and fungus-like plant pathogens can have profound impacts on biota. Those may depend on interactions arising - from co-introduction with the original host plant to biogeographically novel or co-xenic novel associations via spill-over to native or other alien plants. Here, we investigate pathogen-plant associations globally, by combining databases on the regional distribution and associations of plants and pathogens. Specifically, we i) assess the frequency of novel and co-xenic novel associations in the pathogens invaded range, ii) examine the alien pathogens host species richness and phylogenetic divergence within host assemblages as measures of host range breadth, and iii) investigate which alien pathogens, plants and regions are most likely to experience novel associations.

Biogeographically novel and co-xenic novel associations were common, observed in more than one-third of alien plant pathogens and predominantly within their known phylogenetic host range. Novelty of associ-

ations is positively associated with i) plant-species rich regions, ii) globally widespread alien pathogens that show higher phylogenetic divergence in their host assemblages, and that co-occur on economically used hosts in the same region, and iii) geographically restricted woody plants without economic use. We show that novel and co-xenic novel associations are a widespread phenomenon with potential implications for direct impacts on recipient biota, pathogen spread dynamics and interaction networks. Importantly, a substantial proportion of associations could not be classified, highlighting the need to further improve our knowledge of fungal biogeography to better understand the consequences of fungal invasions.

Session 1 – Risk assessment and management of invasive species

INVESTIGATING THE POTENTIAL FOR BIOLOGICAL CONTROL OF THE INVASIVE AQUATIC PLANT, *MYRIOPHYLLUM AQUATICUM*

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Myriophyllum aquaticum, parrot's feather, is an aquatic perennial native to South America that is found established in riparian environments across Europe, North America, Africa, Asia, and Oceania. *Myriophyllum aquaticum* has spread predominantly via anthropogenic vectors like many aquatic invasive species, and has detrimental impacts on native ecological communities, water quality, and recreational activities, while also increasing the risk of flooding. In the introduced range the plant reproduces vegetatively, grows rapidly, and can propagate from small fragments that remain viable for over a year, thus manual removal is unsuitable. *Myriophyllum aquaticum* can be controlled with glyphosate-based herbicides but with significant risk of adverse effects on proximal aquatic communities. Given these management challenges, the potential for biological control of the plant has become a research focus. Research began in 2020 to identify a suitable agent for Great Britain, focusing on the leaf beetle *Lysathia* sp. And subsequently the stem mining weevil *Listronotus marginicollis*. The former having been introduced to control *M. Aquaticum* in South Africa where it has proven a successful agent since its release in 1994. Host range studies for *Lysathia* sp. establishing its specificity and impact on the target plant and non-target test plants will be presented. *Listronotus marginicollis* was previously determined to be specific and damaging in South African studies and the weevil has recently been sourced from its native range in Argentina and a culture held in Australia, for assessment at CABI UK. Previous releases of weevil species as biological control agents against invasive aquatic weeds have proven highly successful. To better understand the genetic diversity of *M. Aquaticum* populations across GB were investigated and mapped, also included in the study was a novel, red-stemmed congener known from the aquatic trade, but naturalised in multiple locations and showing similar invasive tendencies.

Session 3 – Global change and invasions

THE GLOBAL ENVIRONMENTAL IMPACTS OF INVASIVE ALIEN CHYTRID FUNGI ON AMPHIBIANS

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Severe population declines have pushed many amphibian species globally to the edge of extinction over the last decades. Chytridiomycosis -an emergent amphibian disease- has been pointed out as a major driver in many regions where the invasive fungal pathogens *Batrachochytrium dendrobatidis* (Bd) and *B. salamandrivorans* (Bsal) have been introduced. Nevertheless, a systematic quantification of the impacts of these pathogens and the forces driving them is still missing. Therefore, we conducted a comprehensive literature review following the "Environmental Impact Classification for Alien Taxa" (EICAT) protocol. We analyzed the impact mechanisms and magnitude, as well as their confidence, frequency, and distribution across the globe and over the amphibian tree of life. In addition, we tested whether the occurrence of harmful impacts could be explained by environmental predictors and/or species intrinsic traits. We screened nearly 2,200 references and extracted data from around 500 studies considered relevant. From the compiled dataset, we conducted over 600 impact classifications for Bd, and 26 for Bsal, encompassing more than 900 amphibian host species. These species were studied in over 70 countries and cover two found impact mechanisms: Parasitism and indirect impacts through interactions with other species. The main impact "Parasitism" showed geographic and phylogenetic clustering of harmful impact magnitudes. While many recorded impacts were low (Minimal Concern or Minor), nearly one-third of amphibian taxa had at least one harmful impact (Moderate, Major, or Massive) through invasive chytrid fungi. Our study represents the first large-scale application of the EICAT protocol for these pathogens, providing an important contribution to understanding the impacts of Bd and Bsal on different species and geographic regions. This is key for informed management decisions and to optimize the use of scarce resources in the fight against emerging diseases that threaten amphibian conservation.

Session 5 – Conservation issues and biological invasions

STRONGER TOGETHER: CAN GREGARIOUSNESS EXPLAIN THE FIRST AND ONLY SEA SPIDER INVASION IN THE WORLD?

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1- University of Mons

Sea spiders, or pycnogonids, are marine arthropods with unique biology and morphology. Among the 1,400 extant species, only one has become invasive: *Ammothea hilgendorfi* (Böhm, 1879). Originally from the North Pacific Ocean, it has been documented throughout Europe since the late 1970s, yet it has remained largely overlooked by ecologists. Recent fieldwork in Belgium has revealed a population of this species reaching unprecedented abundances, displaying what appeared to be gregarious behavior. Given that gregariousness enhances the reproductive success of a species if there are no other limiting factors – as is the case here – it should be regarded as an invasive trait that may explain its success.
This integrative study employs a combination of fieldwork and ethological experiments using various approaches to investigate the gregarious behavior of *A. hilgendorfi*. First, their spatial distribution was analysed in the field and in a controlled environment. Then, to decipher the factors driving their gregariousness, the reaction of specimens to different stimuli (i.e., phototaxis and intraspecific chemotaxis) was monitored.
Our findings statistically confirmed the gregariousness of that species, driven both by environmental and intraspecific factors. They shed light on the group dynamics and ecological interactions of this alien pycnogonid, contributing to a broader understanding of the first ever invasive population of this taxon understudied for decades.

Session 5 – Conservation issues and biological invasions

BIOLOGY AND CATCHABILITY OF THE ATLANTIC BLUE CRAB IN A CORRIDOR HABITAT FROM THE MAR MENOR COASTAL LAGOON (WESTERN MEDITERRANEAN)

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The Atlantic blue crab (*Callinectes sapidus*) has rapidly invaded the coastal lagoons of the western Mediterranean, but there is still no consistent assessment of its biology and catchability in priority management locations. In a natural corridor zone between Mar Menor hypersaline coastal lagoon and Mediterranean sea, we assessed its population structure, habitat selection (*Cymodocea nodosa* meadows, *Caulerpa prolifera* meadows and bare substrates) and catchability with different trapping methods (fyke nets, collapsible cylindrical traps, and flat bee-hive traps) during a 2-years study (November 2021 – September 2023).
Most captures were of adults and sub-adults, peaking in summer, with the largest crabs detected in November. A significant correlation was found between crab size, habitat type and trap efficiency. Habitat variables and biological factors affected crab catches as a function of size, with subadults showing a positive preference for bare substrate, while depth had a negative impact on both juveniles and sub-adults. Fyke nets proved to be the most effective methodology. Trap type significantly affects capture as a function of crab size and sex, with sub-adults and males being mostly captured in fyke nets. The findings offer an integrated view of the biology of the species and optimal harvesting methodologies, enabling the design of priority control strategies in specific locations to ensure effectiveness and environmental cost-effectiveness.
Part of this research was supported by the Environmental Service and Mar Menor Service of the Government of the Autonomous Community of Murcia (CARM, Spain).

Session 1 – Risk assessment and management of invasive species

FORECASTING POTENTIAL INVADERS TO FUTURE-PROOF PREVENTATIVE BIOSECURITY GLOBALLY

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The ever-increasing and expanding globalisation of trade and transport underpins the escalating global problem of biological invasions. Developing biosecurity infrastructures is crucial to anticipate and prevent the transport and introduction of invasive alien species. Still, robust and defensible forecasts of potential invaders, especially species worldwide with no invasion history, are rare. Here, we aim to support decision-making by developing a quantitative invasion risk assessment tool based on invasion syndromes (i.e. Attributes of a typical invasive alien species). We implemented a multiple imputation with chain equation workflow to estimate invasion syndromes from imputed datasets of species' life-history and ecological traits (e.g., body size, reproductive traits, microhabitat) and macroecological patterns (e.g., geographic range size, commonness, habitat generalism, tolerance to disturbance). We showcase our tool in modelling the invasion syndromes of 466 amphibian and reptile species with invasion history, and projecting these models to amphibians and reptiles worldwide (c.76% global coverage) to forecast species with no invasion history but with a risk of being unintentionally transported and introduced, and establishing alien populations. Invasion syndrome models showed high predictive accuracy with a good balance between specificity and generality. Unintentionally transported and introduced species tend to be common and thrive well in human-disturbed habitats. In contrast, those with established alien populations tend to be large-sized, are habitat generalists, thrive well in human-disturbed habitats, and have large native geographic ranges. We forecast 160 amphibians and reptiles worldwide with no invasion history that have the potential to be unintentionally transported and introduced. Among them, 57 species have a high risk of establishing alien populations. Our tool is a significant addition to the suite of decision support tools needed for developing a future-proof anticipative and preventative global biosecurity.

Session 1 – Risk assessment and management of invasive species

ADDRESSING ENVIRONMENTAL SAMPLING BIAS: A CRUCIAL OVERSIGHT UNDERMINING THE USEFULNESS OF SPECIES DISTRIBUTION MODELLING IN GEOGRAPHIC RISK ASSESSMENT OF ALIEN SPECIES

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Correlative Species Distribution Modelling (SDM) quantifies species' environmental niche based on statistical correlations of environmental conditions in locations where the species have been observed. SDMs can then be used to predict species' environmental suitability across space and in different periods of time. Such predictions are useful in identifying whether a jurisdiction is susceptible to species' invasion. This then informs local authorities on what alien species should be prevented from transport and introduction (e.g., in developing warning lists), or in spatial planning of eradication and control efforts. However, SDM is known to underpredict species' environmental suitability questioning its usefulness for informing invasive alien species management. Well-acknowledged sources of SDM's poor predictive ability are niche shifts and environmental non-equilibrium in invading alien species. Here, we shed light on arguably a more delimiting oversight —environmental sampling bias. Using a Virtual Ecologist approach, we improved existing and developed new approaches for addressing environmental sampling bias: geographical-space based processing — (1) spatial grid sampling, (2) spatial thinning; environmental space-based processing: (3) environmental grid sampling, (4) environmental cluster sampling, (5) environmental distance sampling. We applied five algorithms (Lasso GLM, GAM, BRT, RF, MaxEnt) to model species' environmental niche. The optimal approach was identified based on its ability to improve SDM's usefulness in understanding species' environmental niches (accuracy in reproducing theoretical response curves), predicting (interpolating) environmental suitability in the training region, and projecting (extrapolating) species' environmental suitability globally. Environmental-space based processing approaches performed substantially better than geographical-space based approaches, especially in reliably understanding species' environmental niches and robustly projecting species' environmental suitability worldwide. We demonstrated the effectiveness of the best approach (compared to the most commonly used approach) in assessing the global geographic invasion risk of twelve notoriously invasive frog species. Environmental space-based approaches for addressing environmental sampling bias should be a standard data processing step in SDM workflows to produce reliable predictions of alien species' geographic risk.

Session 6 – Pathways and dispersal of invasive species

CHALLENGES OF DELIVERING SCIENTIFIC ADVICE FOR EVIDENCE-BASED POLICIES ON INVASIVE ALIEN SPECIES IN BELGIUM

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The implementation of the EU Regulation n°1143/2014 on IAS requires sound scientific input to design adequate actions of prevention, early warning and rapid response and management. The role of scientists is important to advise authorities on the way they should prioritize their efforts and to provide necessary evidence, e.g. when choosing management methods.
An efficient collaboration between environmental agencies and scientific experts is therefore needed. In Belgium, the National Scientific Secretariat on Invasive Alien Species has been created to act as a science-policy interface, compile the required data and perform appropriate analysis to feed into the policy making process.
Using three case studies as an example, we will present the opportunities and challenges of providing evidence based scientific advice to environmental authorities. The first case study deals with the identification of priority pathways of unintentional spread and introduction of IAS for which preventative measures should be devised. Based on an assessment of the number of species that are being transported along the pathways, and the impact of those species, we advised authorities on the pathways that should be tackled by action plans. The second example deals with support to the border control agencies in the enforcement of Article 15 on border controls. To this end, we advised which plant and animal consignments should be prioritised for identity checks. This analysis serves as the basis for a first coordinated national campaign of inspections at borders and in shops. Finally, the third example is the production of an assessment of the feasibility of management of Union list species, to inform future management strategies of the environmental agencies.
These assessments highlight the need for increased data quality and quantity (on interceptions, imports or management of species). It also stresses the challenge of adapting the analyses to the reality and priorities of environmental authorities.

Session 2 – New tools and approaches for detection and monitoring

FOUR YEARS OF EARLY WARNING AND RAPID ERADICATION OF COMMON RAGWEED USING CITIZEN SCIENCE: WHERE ARE WE NOW?

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Common ragweed (*Ambrosia artemisiifolia* L.) stands as one of the most economically burdensome invasive alien plants in Europe, owing to its allergenic pollen and agricultural impact as a weed. In Southern Belgium, where the species is in its nascent stages of invasion, the Walloon Ragweed Observatory was established in 2020 to tackle its proliferation.

Utilizing citizen science as the cornerstone, surveillance efforts span Southern Belgium, facilitated through smartphone applications as well as direct engagement with the Walloon Ragweed Observatory. A multi-faceted approach, comprising training sessions, active social media engagement, specialized journal publications, video dissemination, and public media coverage, gradually mobilized stakeholders to report common ragweed sightings. From 25 known populations in 2020, reports have surged to 110, with an annual increase of approximately 30 new populations.

Over time, the proportion of populations directly reported to the Observatory has steadily risen, underscoring its pivotal role in citizen engagement for surveillance. Control measures, entailing the removal and enumeration of all plants, are enacted across recorded populations. Subsequent yearly monitoring detects and removes new plants, if present. Four years into the initiative, 12 populations have been eradicated (with no observed plants for three consecutive years), while 44 are under effective control (with no observed plants at the latest monitoring). The number of removed plants appears to have plateaued at 4000-4500 annually. Nonetheless, certain populations persist despite recurrent interventions, likely due to a robust seedbank, necessitating sustained eradication efforts.

Despite inherent biases in citizen science, the project demonstrates efficacy in curbing exponential population growth. Visits to recorded populations have heightened landowner awareness and revealed predominant introduction pathways, with birdseeds emerging as a significant conduit, with nearly half of the populations situated near bird feeding sites.

Session 5 -– Conservation issues and biological invasions

AMSTERDAM ISLAND – INTRODUCED MAMMALS PLAY CRITICAL ROLE IN THE EPIZOOTIC OF AVIAN CHOLERA THAT THREATEN THE SEABIRD COMMUNITY

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Introduced species are well-known for often becoming invasive and threatening native species through predation or competition. However, their role as a reservoir of infectious diseases is an overlooked additional risk. In this case study, we examine Amsterdam Island in the Southern Indian Ocean, where the introduced brown rat (*Rattus norvegicus*), house mouse (*Mus musculus*), and cat (*Felis catus*) are suspected of playing a critical role in the recurrent and massive avian cholera epizootic that threaten the local seabird community. Although *Pasteurella multocida*, the bacterium responsible for avian cholera, causes outbreaks in a variety of wild birds and mammals worldwide, the situation on Amsterdam Island is unique. Here, outbreaks reoccur almost every year during the seabird breeding season since the 1980s. We employed PCR and sequencing-based approaches to identify which species carried the bacterium, to determine if the strains are shared among different species, and to ascertain whether invasive species continue to carry the bacterium during winters when seabirds are absent. Our study emphasizes the critical role invasive species can play in disease dynamics and exemplifies the efficiency of molecular approaches in unraveling complex disease networks. With the eradication of introduced mammals currently implemented on Amsterdam Island, the subsequent disappearance of avian cholera would provide unequivocal evidence of the keystone role played by introduced species in this infectious disease network.

Session 1 – Risk assessment and management of invasive species

BRIDGING BIOLOGY AND ENGINEERING: ADVANCED SOLUTIONS FOR SUN CORAL INVASION

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The invasive marine species *Tubastraea* spp., originally from the Pacific Ocean, now pose a severe threat to Brazil's biodiversity and marine ecosystems. This invasion has significantly contributed to biodiversity loss over the past two decades, as documented by the Brazilian Platform on Biodiversity and Ecosystem Services. Traditional control methods, involving labor-intensive manual removal with tools such as sledge-hammers and chisels, have been implemented by government environmental agencies in collaboration with NGOs, academics, and volunteers. However, these methods have proven inadequate in addressing the growing challenge - mainly due to coral regeneration capacity - underscoring the vital need for innovative solutions and highlighting the emergent synergy between engineering and biological sciences in environmental management. Our interdisciplinary approach has led to the development and testing of two underwater tools: an impact hammer and a rotating brush, designed with consideration for ergonomic design, operational efficiency, and suitability for SCUBA divers. These tools have proven effective when applied sequentially—first the hammer, then the brush—facilitating the thorough removal of entire colonies as well as smaller fragments that could potentially regenerate if left in situ. Furthermore, biological research into the reproductive biology and growth patterns of the coral has informed the optimal seasons for management interventions, such as before reproductive peaks and before regenerative colonies reach maturity. Our integrated approach has also led to the development of specific procedures and protocols that enhance management efficiency and safety. By integrating engineering innovations with biological insights, our prototypes not only meet the requirements identified by researchers but also promise scalability, offering a new, more effective method for controlling invasive sun coral populations in Brazil.

Session 3 – Global change and invasions

OBSERVED AND POTENTIAL RANGE SHIFTS OF NATIVE AND NON-NATIVE SPECIES WITH CLIMATE CHANGE

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There is broad concern that the ranges of global flora and fauna will not keep up with climate change, increasing the likelihood of population declines and extinctions. Many populations of non-native species already have advantages over native species, including widespread human-aided dispersal and release from natural enemies. But do non-native species also have an advantage with climate change? Here, we review observed and potential range shifts for native and non-native species globally. We show that non-native species are expanding their ranges 100x faster than native species, reflecting both traits that enable rapid spread and ongoing human-mediated introduction. We further show that non-native species have large potential ranges and range expansions with climate change, likely due to a combination of widespread introduction and broader climatic tolerances. With faster spread rates and larger potential to persist or expand, non-native populations have a decided advantage in a changing climate.

Session 3 –- Global change and invasions

RAPID INVASIVE SPREAD OF *ALTERNANTHERA PHILOXEROIDES* IN TIDAL WETLANDS: STRESS TOLERANCE AND ESCAPE STRATEGIES COUNTER SALINITY STRESS WITH SEA LEVEL RISE

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Alternanthera philoxeroides (alligator weed) recently invaded Suisun Marsh in California's San Francisco Bay-Delta Estuary. While considered freshwater-limited, its stress-tolerance capacity to spread with sea level rise was unknown. We monitored patch distribution for six years, studying the spread of the invasion, and selected 18 patches in upper-, mid- and lower-bayward tidal reaches to assess invader abundance and environmental attributes along the gradient. Overall, the numbers of patches in our study area increased by 98%. The greatest increases in the occupied area were in the more saline upper reach and the bayward reach. Interannual patch extinction due to breakage and dispersal occurred in mid-tidal reach. In two greenhouse experiments, we assessed responses of emergent and free-floating growth forms to four salinity concentrations (freshwater to marine) at whole plant, physiological, and biochemical levels. Results document sensitivity of *A. philoxeroides* to increasing salinity, though all experimental plants survived. High sensitivity was reflected in plants traits underlying decreases in net photosynthetic rate and biomass production with salinity increase. Functional trait responses revealed both stress tolerant and stress escape strategies used by *A. philoxeroides* under salinity-induced physiological stress. Supporting tolerance, emergent plants had thicker leaves, and increased water use efficiency and osmotic compounds with increasing salinity though reduced stem lignin concentrations and increased branching support fragmentation. Floating fragments had decreased biomass, SLA, root and leaf mass ratios in higher salinity treatments. However, allocation to adventitious root mass more than doubled during recovery in freshwater, supporting stress escape when ramets disperse to benign environments and establish as an emergent growth form. In the context of climate change and sea level rise, this diversified strategy enables *A. philoxeroides* to withstand temporal increases in salinity and spatial avoidance of salinity by escape via hydrochory to colonizable locations.

Session 6 – Pathways and dispersal of invasive species

THE STORY OF AN INTRODUCED SOIL DWELLER IN THE CHANGING CLIMATE OF IRELAND.

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Prosellodrilus amplisetosus (Annelida, Lumbricidae) is a small endogeic earthworm with a limited distribution in SW France and NW Spain. Given that the *Prosellodrilus genus* has no colonisation history outside of its native range, it is surprising that P. Amplisetosus was reported at locations in SE Ireland within 70 km of each other and ~1000 km north of its endemic range, and recently at a single location in the UK. Survey work at multiple locations across Ireland and the UK has not revealed the occurrence of the species beyond these sites. In 2012, up to ~100 ind./m^2 were found at Airfield Estate, a Victorian-era farm in suburban Dublin. In 2022, we confirmed the continued presence of the species at Airfield and also found it in high numbers around Dowth Estate, Co. Meath, a historically significant site representing some of the oldest farmed land in Ireland. We surveyed the relative abundance of the species in permanent pastures at Dowth; of the 13 earthworm species recorded, P. Amplisetosus was the most abundant (158 ±108 ind./m^2) and significantly higher than all native endogeic species. Stable isotope ratio analyses (C and N) of *P. Amplisetosus* and co-occurring earthworms indicate that it is the most extreme mineral soil feeder; in Irish samples, *P. Amplisetosus* had the most elevated C (δ13C = 9‰) and N (δ15N = -26.6‰) isotope ratios, indicating that this trophic niche was vacant in Ireland before its arrival. Analysis of DNA barcodes for worms from Ireland, UK and France showed that two divergent lineages (both present in France) are found in the isles, suggesting repeated introductions from different populations or a single introduction from a very diverse population. We will report on the implications of these findings for the introduction history and ecological impacts of this species in the context of changing climate in Ireland in general, and human activities at the introduction sites in particular.

Session 1 – Risk assessment and management of invasive species

ASSESSING THE EFFECTIVENESS OF *TRICHILOGASTER ACACIAELONGIFOLIAE* AS A BIOLOGICAL CONTROL AGENT AGAINST *ACACIA LONGIFOLIA* IN PORTUGAL: A SYSTEM DYNAMICS MODELING APPROACH

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The invasion by the Australian *Acacia longifolia* poses a significant threat to coastal and inland ecosystems worldwide, particularly in regions such as the Iberian Peninsula, New Zealand, and South Africa. This species accumulates persistent soil seedbanks which rapidly germinate after disturbance. To control its invasion, the biological control agent (BCA) T*richilogaster acaciaelongifoliae* has been successfully employed in South Africa for over four decades. This agent induces gall formation on *A. longifolia*'s reproductive and vegetative buds, thereby decreasing seed production and vegetative growth, thus hindering dispersal and re-invasion potential.

In 2015, *T. Acaciaelongifoliae* was introduced in Portugal, marking a significant milestone as the first deliberate release of a BCA against an invasive plant in Continental Europe. This introduction prompted the need for a comprehensive assessment of the BCA's efficacy. Using a system dynamics modeling approach, we evaluated *T. Acaciaelongifoliae*'s spread and efficacy on *A. longifolia* within one of the areas where the BCA was released (the Natural Reserve of Dunas de São Jacinto). This dynamic model simulates the establishment, population growth, and ecological impacts of *T. Acaciaelongifoliae* on *A. longifolia*'s seed production and seedbank dynamics over time.

Simulations confirmed the high efficacy of *T. Acaciaelongifoliae*, with significant reductions in seed production, in the short term, and depletion of the seedbank, in the long term, which are consistent with field observations. Furthermore, the model allows for customization of parameters related to BCA release area, and also timings and quantity of BCA individuals released. This allows it to serve as a versatile tool for predicting the effectiveness of *T. Acaciaelongifoliae* in different areas and to support decision-making by testing several alternative *A. longifolia* management scenarios, adjustable to different local specificities, including in areas where this BCA has not yet been released.

Session 1 – Risk assessment and management of invasive species

RISK POSED BY HORNETS TO THE PROVISION OF POLLINATION-DEPENDENT FOOD PRODUCTION

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Hornets (*Vespa* spp.) are general predators of insects, with a particular predilection for honeybees, posing a significant threat to beekeeping and crop production. Among the 22 hornet species identified, some have expanded into new regions due to globalization, such as the yellow-legged hornet (*V. velutina*) in Europe and the giant hornet (*V. mandarinia*) in North America. This study examines the current, potential, and future risks posed by hornets to pollinator-dependent food production worldwide. We illustrate widespread potential impacts globally, particularly in regions like America, where native hornets are absent. Additionally, we demonstrate that although areas with high dependence on pollinators for food production are relatively small globally (~5%), they are of disproportionate importance for crop provisioning. Finally, we identify crops with significant hornet exposure on each continent. These findings underscore the critical need for monitoring and safeguarding these vulnerable areas to align management strategies with international biodiversity goals, considering both hornet susceptibility and the sustainability of pollination-dependent food production.

Session 1 – Risk assessment and management of invasive species

PREVENTION AND AWARENESS OF AQUATIC INVASIVE ALIEN SPECIES IN THE IBERIAN PENINSULA BY THE LIFE INVASAQUA EUROPEAN PROJECT: OUTCOMES.

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The understanding of invasive alien species (IAS) and their impact on aquatic ecosystems within Spanish and Portuguese societies is currently limited, impeding effective policy implementation and management strategies. The LIFE INVASAQUA project, conducted from 2018 to 2023 in the Iberian Peninsula, aimed to address this gap by raising awareness among the public and stakeholders and developing tools for efficient IAS management. The project focused in the achievement of several key objectives in alignment with the EU Regulation on IAS: (1) Developing governance instruments such as strategic recommendations and updated IAS lists; (2) Conducting training to foster updated knowledge and collaboration in key stakeholders by involving 2,900 participants in 98 training activities; (3) Engaging with a broad spectrum of stakeholders and the public, reaching over 480 institutions and up to 246,000 people through a total of 598 events; (4) Enhancing communication and information dissemination efforts; (5) Promoting awareness of IAS issues, evidenced by an increased number of social media followers and positive shifts in public perception analysed through 7,078 questionnaires. These outcomes show that LIFE INVASAQUA is a valuable source of information on IAS, facilitating enforcement and fostering collaboration between stakeholders and the general public. This project is supported by funding from the LIFE Programme of the European Commission (LIFE17 GIE/ES/000515).

Session 1 – Risk assessment and management of invasive species

EMERGING PARASITE INFECTS INVASIVE RUSTY CRAYFISH, TEMPERS INVASION IMPACTS, AND TRIGGERS ECOSYSTEM RECOVERY

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Crayfishes are among the most widespread freshwater invaders, causing ecological harm through competition with native species, predation, and habitat alternation. The rusty crayfish *Faxonius rusticus* is one such species and it impacts lake macrophyte, invertebrate, and fish communities across its invasive range in the US Midwest. Crayfish can also harbor a diverse suite of parasites, including mesomycetozoans, oomycetes, and fungi. These parasites have the potential to mitigate invasive crayfish impacts, but this relationship is not well understood. In 2019, our research team discovered an outbreak of a microsporidian (spore-forming parasite) parasite in rusty crayfish in Trout Lake, Wisconsin (USA). We have identified it as a novel species from the genus *Nosema* and specific to the rusty crayfish. We evaluated the effects of this parasite on crayfish density, condition, activity, growth, and survival using lake-wide trapping surveys, behavioral assays, and a mesocosm experiment. Rusty crayfish in Trout Lake were infected at a high rate by *Nosema* sp. (44% prevalence) and their density has declined by 87% since 2016. Individuals infected with the microsporidium were in poor condition, were less active, had increased mortality, and a decreased growth rate. Concomitant with the decline in rusty crayfish density, we measured a marked increase in benthic macrophytes and an increase in density of the native virile crayfish *Faxonius virilis*. Ongoing work is examining the impact of this novel parasite on the recovery of invertebrate and fish communities, and the relative importance of parasitism on density- versus trait-mediated invasion impacts. Taken as a whole, these findings expand our understanding of the role of parasites in modulating invasion impacts and facilitating ecosystem recovery.

Session 6 – Pathways and dispersal of invasive species

INVASIVE ALIEN PLANTS IN THE CITY: WHERE DO "METROPOLITAN ALIENS" LIKE TO BE?

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Cities are both a cradle of - and affected by - invasive alien plants. The spread of invasive plants through urban agglomerations and corridors can negatively impact both urban ecosystems and remaining natural habitats worthy of conservation. It is therefore crucial to understand how alien plants spread across cities and what anthropogenic drivers favour their persistence. Accordingly, in three of the largest Italian cities and relevant European metropolises (Milan, Rome and Turin), some of the most invasive alien plants, representative of the most common urban alien plants, were selected and their distribution was studied. Based on a stratified sampling design, along a gradient of urbanization, the distribution and abundance of target species were defined in relation to urban elements (e.g. linear infrastructures, gardens and buildings). With more than 20,000 occurrence records, the analysis highlighted the most widespread target alien plants and those urban elements mostly associated with them. Despite biogeographical differences, in all cities *Ailanthus altissima* is highly widespread, together with *Phytolacca americana* and *Sorghum halepense*. Differences were related to aliens such as *Robinia pseudoacacia* and *Ligustrum lucidum* which were frequent in Rome, but not in Milan or Turin where, differently, the cryptic *Ulmus pumila* was unexpectedly widespread. Gardens, both private and public, and roads were urban elements favouring the presence of aliens. Furthermore, artificial surface cover and its degree of fragmentation played a role in the distribution of alien plants. This comparative study of urban alien flora in the largest Italian cities contributes to the understanding of distribution patterns and secondary spread pathways of alien species in highly urbanised contexts of Southern Europe. In addition, the results should support decision-making processes in the planning of measures to prevent negative impacts of invasive species in urban green spaces and reforestation areas.

Session 6 – Pathways and dispersal of invasive species

UNRAVELING THE FIRE-*ACACIA DEALBATA* PAUZZLE IN PORTUGUESE ECOSYSTEMS

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Understanding the dynamics of invasive alien species (IAS) in fire-prone ecosystems is crucial for effective landscape management. *Acacia dealbata*, an aggressive IAS in Portugal, exhibits a complex interaction with fire. Fire influences the species directly, impacting aspects such as germination and the mortality of neighboring species, and indirectly through changes in land-use types. Despite the importance of understanding this interaction, quantification of fire impacts on *A. dealbata* is lacking. In this interdisciplinary study conducted in the North of Portugal, we analyze the interaction between fire and the invasive *A. ealbata*, using both static and process-based modelling approaches. To predict and map the future habitat suitability for *A. dealbata*, we applied a static modelling approach, using species distribution models under various fire suppression and land-use management scenarios. Static models are well-suited to determine the influence of several fire characteristics (e.g., intensity, size, etc.) on the species, however, these models can have limited value for discerning the direct and indirect effects of fire on *A. dealbata* and the detailed nuances of their interaction. To overcome these limitations, and complement our analysis, we developed a process-based approach to understand the detailed effects of fire on *A. dealbata* dynamics. Unlike static models, process-based models analyze the ecological processes driving the system. However, extensive data requirements and scale constraints limit their application. Therefore, the importance of integrating static and

process-based modelling approaches is underscored by this research. By using the strengths of each modelling approach, we get closer to fully understanding the fire-invasion interaction. In this sense, we highlight the interplay between the outputs of this multi-model framework and their contribution to an increased efficiency and usefulness of methods for assessing, anticipating, and mitigating biological invasion impacts.

Session 3 – Global change and invasions

COMPETITION BETWEEN CONGENERS: HAS THE ZEBRA MUSSEL CHANCE AGAINST THE NEWCOMER QUAGGA MUSSEL? A LONG-TERM MONITORING STUDY ON THE INVASION DYNAMICS OF DREISSENIDS IN LAKE BALATON, CENTRAL EUROPE

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The invasion of the two Dreissena species – the zebra (ZM, *Dreissena polymorpha*) and the quagga mussels (QM, *Dreissena rostriformis bugensis*) - have numerous undesirable impact in Europe and Nort America. In Lake Balaton, the largest shallow lake in Central Europe, like in most European lakes, the ZM established first, altered the habitat, paved the way for subsequent QM invasion, which evoked an intense interspecific competition. Long-term dataset on invasion would reveal critical factors influencing this interaction.
We followed size, abundance, density and biomass of dreissenids seasonally at different sampling sites, and at two depths (near the water surface and on the bottom) in the stony littoral zone from the introduction of the QM (2008) to the present day. We measured water quality parameters on site, and chlorophyll-a in the laboratory.
The dynamics of the ZM and QM competition varied across different habitats in Lake Balaton. Water level fluctuation, available substrate surface, seasonal water temperature and water depth affected the competition and influenced the displacement of the ZM by the QM. However, food availability proved the most effector on this process. In areas with poor food conditions, the displacement was rapid (4-5 years), as it happens in most European lakes, while in areas with better food conditions, the two species still co-exist (even after 15 years). We found that the QM grew more intensely than the ZM, whereas in the size (length) and population dynamics, there were differences among habitats and depth depending on the trophic level. The present study shades light on the intricate interplay between the two congener invasive mussels and underscores the importance of an ecological survey in uncovering the shaping of their coexistence. Understanding the dynamics of their invasion is crucial for set up effective management and conservation strategies.
Supported by NP2022-II3/2022 and RRF-2.3.1-21-2022-00014.

Session 6 – Pathways and dispersal of invasive species

SHIFTS IN DISPERSAL TRAITS OF A HETEROCARPIC PLANT ACROSS ITS INVASION ROUTE

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Dispersal ability can play a key role in the range expansion of invasive species and was suggested to increase in populations at the leading front of their invasion. However, vey few studies have examined this idea in invasive plants. Moreover, in heterocarpic plants, which produce propagules with varying dispersal abilities, dispersal potential can also vary via investment in the proportion of dispersing morphs (termed dispersal rate), but very little is known about the way investment in dispersal ability vs. dispersal rate varies across invasion routes. We examined the interplay between these traits across the invasion route of the heterocarpic plant *Heterotheca subaxillaris*. Capitula of *H. subaxillaris* were collected from eight populations along its invasion route. Dispersal ability of the pappus-bearing propagules was measured as the ratio between pappus width and biomass. Dispersal rate was calculated as the ratio between the number of these propagules and total propagules per capitulum. Dispersal ability and dispersal rate were found to be negatively correlated across populations of *H. subaxillaris*, with a greater investment in pappus width in populations at the leading front of the invasion compared to a greater proportion of dispersing achenes in core populations. These results suggest a trade-off between dispersal ability and dispersal rate, which could contribute to the invasive success of heterocarpic plants, facilitating both greater expansion potential, along with greater proportion of seeds that remain in a safer maternal environment when reaching novel conditions at the leading front of the invasion.

Session 3 – Global change and invasions

INITIAL FINDINGS FROM THE INTEGRATIVE CONYZA NETWORK FOR CONTEMPORARY TRAIT EVOLUTION (ICONNECT)

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Contemporary evolution is common when plant species expand into non-native habitats, confronting novel ecological challenges amidst ongoing global change. Despite its prevalence, our understanding of this phenomenon remains incomplete, often overlooking within-range variations and interdisciplinary methods. Addressing these gaps, the integrative network iCONNECT offers a holistic framework, presenting results from an initial study utilizing a global sampling strategy across diverse environments and ranges.

We conducted a greenhouse experiment including 108 native and 176 non-native populations of *Conyza canadensis*, spanning broad spatio-environmental gradients across its ranges. These populations underwent a competition x drought treatment regimen. Employing a multi-omics approach, we analyzed samples to elucidate: 1) phenotypic variation (competitive ability under wet and dry conditions), 2) eco-metabolomics (root exudate mass spectrometry), 3) root-fungal interactions (amplicon sequencing), and 4) population genomics (ddRADseq).

Our results unveil several key insights: 1) Interspecific competition had more detrimental impacts on native populations, amplified by experimental drought. 2) Drought increased metabolomic diversity only in non-native populations. 3) Drought altered root-fungal community composition specifically in non-native populations, correlating with plant performance under drought stress. 4) Bayesian clustering revealed strong associations between population genetic structure, and phenotypic and eco-metabolomic traits.

Multi-omics integration offers insights into contemporary evolution amidst complex interactions. Future research may target key metabolites, biotic interactions, and genomic regions shaping competitive ability and adaptation under varying moisture, advancing our understanding of evolutionary responses to global change. We extend an invitation for collaboration to researchers interested in utilizing our sampled populations for supplementary investigations into the drivers of contemporary evolution across diverse ecological traits.

Session: Session 5 – Conservation issues and biological invasions

ALIENS LYING BENEATH THE RHODOLITHS: NEW REPORTS OF POLYCHAETA NON-INDIGENOUS SPECIES (NIS) FOUND IN IBERIAN PENINSULA ASSOCIATED WITH CRUSTOSE CORALLINE RED ALGAE

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Rhodoliths are aggregations of red coralline algae that create a complex structure that sustains highly diverse benthic communities commonly observed globally in littoral marine environments. However, research on rhodolith-associated diversity (such as in-depth taxonomic and ecological surveys) has been limited when compared to other biogenic habitats (remarkably in the European Atlantic). We studied Polychaeta and Pycnogonida associated with rhodoliths in the northwest Iberian Peninsula, Southern Europe. A series of intertidal pools from two beaches were sampled and, in each, three rhodoliths were seasonally collected for subsequent sorting of the macroinvertebrates. Specimens were identified to the species level, whenever possible, based on morphological taxonomic keys and were alcohol-stored (vouchers) for further cross-checking. Furthermore, individuals were sequenced to produce barcodes to be published in BOLD systems. Herein, four new NIS were recorded for the first time in the Portuguese coastline associated with rhodoliths. The species B. proboscidea has its first record of reproduction outside of its original introduction point. We highlight that rhodoliths harbour NIS that had been overlooked so far and that their monitoring should also consider these important ecosystems.

Session 3 – Global change and invasions

EFFECTS OF MULTIPLE GLOBAL CHANGE DRIVERS ON INVADED PLANT COMMUNITIES

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The increasing number of global change drivers, such as nitrogen deposition and pollution, are impacting plant communities. Within invaded communities, these global change drivers further influence species coexistence due to differential responses of alien and native plants. However, information regarding the impacts of multiple global change drivers on invaded plant communities remains limited. To address this gap, we established coexisting plant communities of alien and native species and exposed them to varying numbers (from 0 to 5) of global change drivers. We tested the effects of increasing numbers of global change drivers on individual and community levels. We found that as the number of global change drivers increased, the biomass proportion of alien plants increased, while community diversity gradually declined. Plant height decreased with the increasing number of global change drivers, but alien plants exhibited less reduction relative to native ones. Our findings highlight the importance of considering the multifactorial nature of global change for understanding coexistence between alien and native plant species.

Session 1 – Risk assessment and management of invasive species

THE ISSUE OF "STERILE CULTIVARS": *DURANTA ERECTA* AS A CASE STUDY

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Sterile cultivars of invasive plants might be a safer alternative if they have a lower risk of invasion. The "cultivar issue" is an important aspect arising in invasion biology which is still at beginning stages. We assessed sterility of three assumed sterile cultivars of *Duranta erecta*, "Sheena's Gold" (SG), "Sapphire Showers" (SS) and "Goldmine" (GM) and used wild type (WT) plants for a control. "Sapphire Showers" produced the most flowers but had a low fruit to flower ratio (1 fruit for every 44 flowers) followed by SG (4 fruit for every 17 flowers) and GM did not produce any flowers or fruit. Pollen viability (assessed with fluorescence dilactate staining) was similar between WT (72.11 %) and SG (69%) whilst both significantly higher than SS (34%), and scanning electron microscopy showed signs of "damaged" pollen grains in SS. Seeds from WT plants had higher germination at both experimental temperatures (21.67% at 15 and 25°C) than SS (3.33% at 15°C and 1.67% at 25°C) and SG (3.33% at 15°C and 1.67% at 25°C). Seed viability (assessed with tetrazolium) also showed that WT seeds were significantly more viable (17%) than SG (1.5%) and SS (9.5%). Propagation from cuttings showed that 82% of SG, 63% of GD, 30% of SS and only 4% of WT cuttings survived. However, surviving SS cuttings had the highest root (1.67) and shoot (0.89) growth rates. Floral morphology indicates that the petals and stigmas are distinct in SS compared to WT and SG. In conclusion, the three studied cultivars of *D. erecta* had lower fecundity than WT plants indicating signs sterility. Subsequently, we used iNaturalist to assess the invasive status of *Duranta erecta* in South Africa. Based on this, we propose various regulatory options for cultivars of invasive plant species and gathered insights about the perceptions of sterile cultivars.

Session 5 – Conservation issues and biological invasions

SPATIO-TEMPORAL DYNAMICS AND TROPHIC ECOLOGY OF FREE-RANGING CATS ON A SUBTROPICAL OCEANIC ISLAND

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Free-ranging cats (*Felis catus*) pose a significant threat to biodiversity. However, little is known about their trophic ecology, population dynamics, and ecological drivers in insular ecosystems. This study used traditional approaches and DNA metabarcoding to assess the diet of free-ranging cats and large-scale camera trap study to investigate their abundance and activity in a peri-urban protected area on the subtropical Madeira Island, Portugal. Cats were found to consume a wide range of native and non-native vertebrates, including multiple endemic taxa (e.g., Madeira Wall lizards – present in over 40% of the analysed samples). Furthermore, over a total of 1170 trap-nights, we estimated a density of 1.6 cats per km^2 in 2023, representing an increase of 0.2 cats per km^2 in just two years. Cats were particularly abundant in the vicinity of the only known breeding colony of Manx shearwater (*Puffinus puffinus*) on the island, and the dependency of cats on human food subsidies changed between study periods. Our results support that evidence-based management of insular cat populations is urgently needed.

Session 2 – New tools and approaches for detection and monitoring

GLOBAL MULTI-TAXA ASSESSMENT OF THE ADEQUACY OF ALIEN SPECIES OCCURRENCE DATA

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Biological invasions are one of the most severe threats to biodiversity. However, the patterns of alien species' geographical distribution are still insufficiently studied. Identifying these patterns and quantifying data gaps and limitations is critical to understand and control current invasions and prevent further spreading. Here, we present the first multi-taxon global assessment of the state of occurrence data for alien species. We analysed global checklist databases representing alien species' distributions of nine taxa - birds, mammals, amphibians, reptiles, freshwater fish, ants, spiders, vascular plants, and macrofungi. We assessed the availability of GBIF-facilitated occurrence records per region and taxon, producing different data adequacy metrics relevant for understanding alien distributions/niches and range dynamics. Our findings identify Western Europe, North America, and Oceania as the continents with the best data adequacy, and Central Asia, parts of Africa, and Eastern Europe as mostly data deficient. Birds are the taxon with best data availability, while macrofungi and invertebrates show the biggest data gaps. Geographical, taxonomic, and temporal gaps and biases in species distribution data hamper analyses and monitoring needed for accurate assessments of biological invasions. The results presented here shall guide future efforts to reduce gaps and biases in data availability on alien species.

Session 1 – Risk assessment and management of invasive species

20 YEARS OF HERACLEUM IAS ERADICATION – ESTONIA'S EXPERIENCE

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In Estonia Sosnowsky`s hogweed (*Heracleum sosnowskyi*) is a Legacy of the Soviet Union. It was grown in the fields for silage and was left to spread when the Union collapsed. In 2003, Estonia decided to launch an eradication project because of the threats to biodiversity and human health.
In 2005, an eradication plan was compiled and the state decided to focus on the entire hogweed population – all of Estonia. A geographical database was created, a manual of different eradication methods compiled, contractors found and state funding confirmed.
The main treatment methods consist of treating the plants with herbicides, digging up the roots and cutting off the flower heads. Each site has its own method and depends on the environmental conditions and restrictions. In 20 years, the total area treated has increased to 2,400 hectares, but new sites continue to be found, ca. 100 hectares per year, as well as areas where there is new growth. The results are slow, the contractors become lazy and the budget continues to increase. Large projects such as this are faced with a number of different problems – angry landowners, restricted border areas between Estonia and Russia, closed territories and landfills, areas with rare species, organic farming etc.
For the future several needs are foreseen, namely increasing the qualification of contractors, alternatives to herbicides, new methodological approaches, assessing effectiveness, eradication obligation towards landowners, using remote sensing methods to find new invaded sites, and preventing the spread from neighbouring countries.
Nowadays, Estonians are well aware of the dangers of hogweed, believe it is important to eradicate it and expect the state to do so. The eradication of hogweed is now used as a good example to explain what an invasion by an alien plant implies, including its costs.

Session 6 – Pathways and dispersal of invasive species

BIOLOGICAL INVASION RISKS FROM FARMING INSECT FOR FOOD

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The consumption of insects is increasingly recognized as a solution to ensure food security, reduce malnutrition, and alleviate environmental pressure, driving a global expansion of insect farming. Nevertheless, insects are renowned for their successful invasions across diverse ecosystems, resulting in significant ecological and economic damages. Consequently, the industrial rearing of insects for food production poses a new dimension of global change: the risk of exacerbating biological invasions. Our study aims to anticipate both current and future potential regions for invasion by edible insect species. To achieve this, we initially updated an edible insect database containing over 1500 edible species. Then, we utilized species distribution models incorporating edible species occurrences, alongside environmental variables that characterize species distribution (e.g. temperature, wind, humidity, net primary production). We combined models (MaxNet, Random Forest and XGBoost) to generate comprehensive maps delineating suitable areas for each species. Finally, we gathered insect farm locations on google maps to identify farms susceptible to introducing new biological invasions. Our findings reveal a list of species which should not be farmed and highlights countries where edible species might establish such as Europe, Northeast America, Southeast Africa, East Asia, Southeast Australia, and New-Zealand. In addition, we highlight countries for which insect farming poses a lower risk of biological invasions.

Session 1 – Risk assessment and management of invasive species

UNCOVERING TROPHIC VARIABILITY OF THE INVASIVE ATLANTIC BLUE CRAB *CALLINECTES SAPIDUS* ALONG AN INVADED ATLANTIC AREA BY STABLE ISOTOPES

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New insights on trophic role, ecological interactions and potential impacts on ecosystems of invasive blue crab *Callinectes sapidus* was studied by δ13C, δ15N, and δ34S across invaded Atlantic coastal areas (estuaries and salt marshes). This is the first assessment of the trophic role of the blue crab in the Atlantic invaded range. Our results determined that the blue crab shows an omnivore behaviour, occupying a trophic position (TP:2-4) like that described in its native and in the invaded Mediterranean range.
Spatial variability in the trophic role between specific types of coastal ecosystems (estuaries and salt marsh) across the study region were identified. The salt marsh displayed enriched δ13C values compared to those from estuaries, associated with a switch in the primary producers across the different food web bases.
The ability of the blue crab population to adapt its food-sources based on availability or environmental conditions within similar habitats (estuaries) was also identified, showing a wide range of δ15N and δ34S and trophic position rank values. In the case of δ15N values, it may be associated with prey availability or with environmental nitrogen inputs originated in the human activities, which directly affects the δ15N values at the base of the food web.
No clear seasonal variability was detected in the Guadalquivir estuary, otherwise we found sexual variation in the isotopic signature. Males were enriched in δ15N (17.4 ± 1.43‰) compared to females (15.9 ± 1.99‰), that suggests that males eat more on secondary consumers than females.
Similar spatial distribution rank across different habitats, between native and invaded areas were detected at this study. The blue crab exerts a diverse and wide trophic role in the invaded Atlantic area including putative variation in food sources and consumption at different trophic levels within the food web.

Session 1 – Risk assessment and management of invasive species

MOBILIZING CITIZENS AND STAKEHOLDERS: THE PORTUGUESE NETWORK FOR INVASIVE SPECIES STUDY AND MANAGEMENT

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The challenge of managing invasive species in Portugal is hindered by low citizen and stakeholder engagement, leading to inadequate management. Despite scientific progress, disseminating knowledge to managers, decision-makers, and the public remains challenging. In late 2020, the Portuguese Society of Ecology (SPECO) established the Portuguese Network for Invasive Species Study and Management (Rede InvECO) to address this issue. Boasting a diverse membership of over 240 individuals from varied backgrounds, Rede InvECO not only fosters networking and promotes specialized working groups but also leads two key initiatives to tackle biological invasion challenges.

The first initiative is a series of webinars titled 'Invasoras às quartas' (Invaders on Wednesdays) held on the third Wednesday of each month since 2021. Now in its third annual cycle, 24 webinars have engaged a diverse audience, including teachers, conservation, forest and municipality technicians, and others. Featuring speakers from various backgrounds and covering a wide range of themes, taxonomic groups, and environments, these webinars have garnered significant interest, with over 2000 participants. All webinars are accessible on the SPECO YouTube channel and have gathered over 5900 visualizations.

The second initiative is a national awareness week on invasive species, initiated in 2020 by INVASORAS.PT platform and expanded to Spain the following years. Since 2021, it is promoted by Rede InvECO, INVASORAS.PT, the LIFE projects COOP Cortaderia and INVASAQUA, and the (Spanish) Specialist Group on Biological Invasions. Numerous other entities participate organizing diverse activities, including, e.g., control actions, lectures, exhibitions, and social media campaigns. 140, 175, 257, 282, and 387 activities were organized by 80, 138, 228, 254 and 220 entities, from 2020 to 2024, respectively.

We analyze Rede InvECO's collaborative efforts to raise awareness and engage stakeholders in managing invasive species in Portugal and show its success in uniting diverse stakeholders and yielding promising results.

Session 1 – Risk assessment and management of invasive species

BARENTS INVASIVE ALIEN SPECIES: ENCOURAGING TO IAS MANAGEMENT THROUGH COLLABORATION AND COMMUNICATION

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Barents Invasive Alien Species project, funded by the Ministry of Foreign Affairs Finland, encourages inhabitants and stakeholders in the Euro-Artic Barents region of Finland, Sweden and Norway to the management of invasive alien species (IAS). The target area consists of fragile northern nature with multiple valuable species and ecosystems for the northern biodiversity and culture. IAS pose an increasing threat to the northern nature and the people residing in the area, which is why it is important to direct focus towards the IAS problem in the north now.

We have established a network for invasive alien species stakeholders of the Euro-Arctic Barents region for the purpose of sharing knowledge, best practices and bottlenecks in IAS work. We also produce videos and other materials to inform inhabitants about the invasive alien plant species and encourage them to conduct eradication measures.

Invasive alien pink salmon (*Oncorhynchus gorbuscha*), a fish species from the north Pacific, has dramatically increased in the Barents Sea rivers since 2017, making it a potential threat to the native fish species (e.g. Atlantic salmon *Salmo salar*) and the northern ecosystems. In 2022 - 2023, together with local Sami fishers, we developed fishing methods for pink salmon and tested them in the Teno river in Finland in 2023. In spring 2024, we are studying seaward migration of pink salmon juveniles, their impact on river ecosystems and how the species can be managed in that stage of the life cycle.

We give an overview of the project and give examples of lessons learned. We discuss the importance of cooperation, information sharing and communication in IAS management. We also discuss our findings in he pink salmon research conducted during this project.

Session 1 – Risk assessment and management of invasive species

INNOVATIVE CONTROL OF THE INVASIVE TREE SPECIES *AILANTHUS ALTISSIMA* WITH A NATURAL, SELECTIVE HERBICIDE (AILANTEX®) DEVELOPED ON THE BASIS OF THE WILT FUNGUS *VERTICILLIUM NONALFALFAE* STRAIN VERT56

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Originally native to Asia, *Ailanthus altissima* was brought to Europe in the 18th century as an ornamental tree and is now widespread on all continents except Antarctica. Since 2019, *Ailanthus* has been put on the EU List of invasive alien species of union concern. *Ailanthus* not only displaces the native flora in nature reserves, invading forests, vineyards, fruit orchards and even arable land, but also causes problems and damage along railway tracks, roads, pipelines, flood protection embankments and housing foundations. Previous control strategies include mechanical and chemical measures, which are very time-consuming and costly and, in the case of herbicide applications are already banned in many countries.
In 2011, Maschek and Halmschlager derived a virulent *Verticillium*-isolate from a dying *Ailanthus* tree, which has shown promise as a biocontrol agent and became the active substance of Ailantex®. Application is done by injection of a spore suspension into the xylem (Maschek and Halmschlager, 2016). Once absorbed, it spreads via the sap stream and is later also transferred to neighbouring *Ailanthus* trees by root connections(O'Neal and Davis 2015, Dubach et al. 2021). Consecutively, trees develop wilting symptoms and die. Various studies have tested the effect on non-target organisms. These proved no susceptibility for more than 30 tree species relevant to forestry and nature conservation (Lechner et al. 2022). Preliminary results of studies on grapevines and fruit trees also indicate resistance/tolerance. Only the horticultural/agricultural crops petunia, cucumber and spinach have proven to be susceptible (Dauth et al. 2022) so far.
In 2022 an EU dossier was submitted by the Austrian company biohelp for the registration of *V. nonalfalfae* isolate Vert56 a new active substance. Ailantex® has already been used in Austria, France and the Czech Republic on the basis of emergency authorizations and is being tested in trials in other European countries.

Session 1 – Risk assessment and management of invasive species

A PAWS FOR THOUGHT: ASSESSING THE ECOLOGICAL FOOTPRINT OF DOMESTIC CATS

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In a recently published report, VKM (abbreviation of the Norwegian name for the Norwegian Scientific Committee for Food and Environment) evaluated to what extent keeping cats poses a risk to biodiversity in Norway. Risks were assessed separately for threats to biodiversity from direct predation, indirect (non-lethal) effects, competition with other wildlife, and spread of infectious organisms. VKM also assessed the risk of reduced animal welfare related to the keeping of domestic cats, both for the cats and their prey. Risks related to direct predation were assessed separately for birds, mammals, reptiles, and amphibians. We based our evaluation on publicly available information, including an extensive search for information in the scientific literature. Overall, we found that the risk of negative impact on vulnerable birds and red-listed mammalian species are high under certain conditions. We estimated that the 690,000–870,000 owned and feral cats kill between 21 and 69 million prey each year in Norway, and we found that the risk of negative impact on vulnerable birds and red-listed mammalian species are high under certain conditions. Climate change seems likely to increase the negative impacts of cats on biodiversity. We concluded as well that there is a considerable risk associated with increased spread of infectious organisms from cats to wildlife and to other domestic species; some of these infectious organisms can infect humans. VKM assessed a range of risk-reducing measures aimed at minimizing the risk of negative impacts on biodiversity and animal welfare. We concluded that measures that reduce hunting success (such as collars, bibs or bells) can mitigate the adverse impacts of cats on biodiversity but that limiting cats' access to prey populations would give the greatest positive result.

Session 5 – Conservation issues and biological invasions

PERSPECTIVES ON POLICY AND GOVERNANCE FOR BIOLOGICAL INVASIONS: LEGAL, ECONOMIC, AND BEYOND

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Biological invasions are a major driver of environmental change and biodiversity loss, and their impacts on global and local socio-ecological systems have intensified in lockstep with human development and progress. Accelerating globalisation processes linked to international trade and long-distance transportation continue to facilitate the introduction and spread of invasive alien species, amplifying their ecological, economic, and socio-cultural impacts. Consequently, the management of biological invasions has become an increasingly relevant topic for public policy agendas. While many global goals have been defined, and laws and regulations have been established in many countries, challenges persist in fully realising the objectives they set forth.

Under the ever-changing and interconnected fabric of today's globalised political economy and ecology, uncertainty and risk have further increased, adding even more layers of complexity to socio-ecological systems. Thus, societal action towards biodiversity, ecosystems and its drivers of change has to be rethought and reimagined, and the development and implementation of adaptive governance approaches that can combine the use of tools informing what to do (based on rationality, decision theory and scientific knowledge), with those informing how to do it (based on ethics, attitudes, values and beliefs) is urgently needed. We review governance models and policy approaches and discuss the potentially complementary role(s) of governments, markets and civil society in achieving sustainable management of biological invasions that can reconcile ethics and rationality. From an interdisciplinary perspective, it is argued that diversity (i.e., policy mixes) and decentralization (i.e., different governance levels and models) are essential for achieving flexible, adaptable and effective policies in the face of the inevitable uncertainty associated with both invasion processes and dynamic social structures.

Session 3 – Global change and invasions

FILLING THE URBAN NICHE: ASSESSING DARWIN'S NATURALIZATION CONUNDRUM ON INVADED ITALIAN BIRD COMMUNITIES

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Darwin's naturalization conundrum, applied to invasion ecology, is based on two main predictions: the "environmental filter" prediction (i.e. established alien species are closely related to local native species) and the "limiting similarity" prediction (i.e. established alien species are distantly related to local native residents). These contrasting mechanisms are particularly evident for birds, since both predictions have been supported: "environmental filtering" in large scale studies, and "limiting similarity" at smaller scales. Nonetheless, both establishment mechanisms are well known to occur more frequently in more human-disturbed habitats (e.g. urban areas) than in more natural habitats. Therefore, the aim of our study was to identify which of Darwin's predictions has driven the establishment of alien species in Italian urban areas, surveying bird communities in 220 points across 6 Italian cities during both the breeding and wintering seasons. We used trait-based analysis to estimate the functional niche space of bird communities, focusing on the Functional Dispersion (FDis) and contribution (FCont). We found that alien bird species (represented by two parakeet species) were more likely to establish in a vacant niche of the functional space of urban bird communities. This evidence was supported by the finding that communities invaded by alien species were characterized by the "limiting similarity" prediction, since both parrot species showed a marked dissimilarity (high FDis) with respect to native bird species. Therefore, due to their intrinsic high disturbance and low species richness, urban environments offer novel niches that are occupied by alien bird species, likely avoiding competition with native species.

Session 2 – New tools and approaches for detection and monitoring

NEW PROTOCOL TO ANALYZE ALIEN SPECIES PER-UNIT-EFFECTS AND THEIR RESPONSE TO SOCIO-ECONOMIC AND ENVIRONMENTAL VARIABLES

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Predicting the impacts of invasive alien species requires predicting their distribution, abundance, and per-unit-effects. Most efforts have been put on the first two components so far, and only recently has a general approach been developed (GIRAE - Generalised Impact = Range size x Abundance x per-unit Effect), enabling us to disentangle per-unit from total effects. This is crucial to understand species and environmental attributes that cause high impacts. Here we propose a standardised protocol to apply the GIRAE approach for single invasive species in multiple countries or regions and derive their country- or region-specific per-unit effects, using species distribution models to obtain range and abundance metrics for each one. We illustrate this protocol using economic damages caused by alien species, including four plants (*Ambrosia artemisiifolia*, Heracleum mantegazzianum, *Lantana camara*, *Pontederia crassipes*), and five insects (*Aedes aegypti*, *Diabrotica virgifera*, *Maconellicoccus hirsutus*, *Spodoptera frugiperda*, *Tuta absoluta*), in different countries worldwide. Economic damages are extracted from the INVACOST database, the most complete database on the economic costs of invasive species. We then analyse the relationship between per-unit-effects and socio-economic and environmental variables using generalised linear models. Per-unit-effects showed consistent positive relationships with GDP, negative with the percentage of protected areas, and mixed with agricultural extent, number of alien species and precipitation, indicating species-specific influence of those variables. Relationships nonetheless differed between islands and mainland, and model performance were higher in developed than developing countries, likely reflecting less consistent assessment and reporting of economic costs. Our protocol therefore disentangles for the first time the different variables that affect invasive species per-unit-effects for multiple species and countries and will be a useful tool for decision making and anticipating the future impacts of invasive species around the globe.

Session 6 – Pathways and dispersal of invasive species

QUANTIFYING AS OCCURRENCES AND THEIR ASSOCIATION TO COMMON INVASION CORRIDORS IN MAINLAND ECUADOR

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Biological invasions have been generally overlooked and understudied in megadiverse countries such as Ecuador. In order to properly assess threats to a plethora of native and endemic species, it is paramount to generate well-curated datasets and graphical analyses to identify trends and effective management plans for Alien Species (AS). Here, we present a systematic and spatial analysis of the potential variables that may influence the presence of AS in continental Ecuador, with focus on roads and rivers. We spatialized the GRIIS database for continental Ecuador, obtaining 86,286 records and 633 species. Based on a distance and clustering analysis, we find an important relationship between invasion corridors such as roads and rivers and the detection of alien species in the country. Of all AS in Ecuador, we find 30.6% of the records and 83% of the species within a distance of 1 km from the rivers, and 22.2% of the records and 74% of the species, within a distance of 1 km from the roads. After disaggregation of categories within rivers and roads, we find non-significant differences of detection of species and records between main and local roads. On the other hand, we find differences between recorded species close to main rivers or streams, where both number of records and species are higher in streams. Of the 15 most commonly recorded AS, all but three were shared between rivers and roads. Finally, we evaluated the association of AS to three types of flood zones, and found a high concentration of records within Amazonian temporal flood zones, indicating the Ecuadorian Amazon is at high risk of increasing propagule emission and should thus receive immediate attention for effective and timely monitoring and control.

Session 5 – Conservation issues and biological invasions

OVERLOOKED BIODIVERSITY LOSSES: THE FATE OF EUROPEAN CRAYFISH ECTOSYMBIONTS AMIDST THE INVASION OF SIGNAL CRAYFISH

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Invasive alien crayfish are widely recognized as a threat to native crayfish populations. However, broader ecological impacts of invaders on crayfish-associated biota remain unexplored. We investigated the impact of signal crayfish (*Pacifastacus leniusculus*) invasion on native branchiobdellids (*Annelida: Clitellata*) of noble crayfish (*Astacus astacus*). Field observations in a small foothill stream revealed markedly reduced abundances, or complete absence, of branchiobdellids and their cocoons on invasive signal crayfish compared to native noble crayfish. Additionally, investigation of signal crayfish in two more localities which were originaly inhabited by noble crayfish, revealed complete absence of previously documented branchiobdellids. Subsequently, we conducted a laboratory experiment in which signal crayfish and noble crayfish were individually infested with two branchiobdellid species, *Branchiobdella parasita* and *Branchiobdella pentadonta*, in separate aquaria. Our results demonstrated that the probability of survival of both branchiobdellid species was significantly higher on noble crayfish carapace. The observed survival advantage of symbionts on noble crayfish could be attributed to: i) differences in grooming behavior between two crayfish species, with signal crayfish diplaying intensive and more effective grooming behavior, and ii) body surface morphology, with signal crayfish exhibiting smoother body surface. In conclusion, our field observations, corroborated by the results of a controlled laboratory experiment, indicate limited adaptive capacity of branchiobdellid symbionts as a response to replacement of their host species. As native crayfish populations continue to decline, our findings underscore the vulnerability of native branchiobdellid species as the next taxa likely to face decline due to signal crayfish invasion, and emphasize the need for comprehensive conservation strategies that account for the ecological relationships between native crayfish and their associated biota in the context of biological invasions.

Session 6 – Pathways and dispersal of invasive species

TIME MATTERS IN FISH INVASIONS! SHORT WINDOW OF ANGLERS' ENGAGEMENT IN CONTROL ACTIONS

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Time matters on invasive species management particularly to guarantee a successful eradication or control. A less studied approach is the effect of time on stakeholders' perception on invasive species management and understanding. This study evaluated anglers' perception and willingness to participate in invasive fish control actions in two Iberian rivers with distinct invasion histories. We conducted a bilingual survey to address target fish species and introduction frequency promoted by Iberian anglers in two locations representing an important invasion route of many non-native fish species in the Iberian Peninsula. Results showed that anglers interviewed in the Ebro River region reported a higher number of introduction events for recent fish invaders, such as European catfish, pikeperch, and also that those species had higher angling popularity compared with the responders from Lower Tagus region. In accordance, this reality was similar when we considered the data obtained for the respective countries where these regions are inserted, with higher levels of popularity and introduction events reported for these fish species in Spain than in Portugal. Additional propagule pressure calculations showed that even if a small percentage of anglers engage in illegal introductions, the number of fishes introduced per year could be very high, making the most popular species more likely to spread on river basins. Thus, when fish invasion occurs, there is a small window of opportunity to control a certain species before that species starts to spread, rises its numbers, and also gains popularity among anglers.

Session 1 – Risk assessment and management of invasive specie

PREVENTING INVADER'S EXPANSION: DEVELOPMENT AND ASSESSMENT OF A SELECTIVE VERTICAL SLOT FISHWAY TO PRECLUDE A NON-NATIVE INVASIVE CYPRINID PASSAGE

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Across the globe, invasive fish species pose a significant threat to the degradation of freshwater ecosystems. In regulated rivers, where dams and weirs disrupt longitudinal connectivity, fishways are generally the mitigation solution employed to facilitate fish movements. However, these engineered pathways can also turn into a fast lane for invasive fish dispersion, making it rather challenging for managers to decide whether to install these devices. To tackle this problem, an experiment was conducted on a full-scale vertical slot fishway (VSF) to assess the passage performance of the widespread invasive cyprinid, the common carp (*C. carpio*) and compare it with an Iberian native cyprinid – Iberian barbel (*L. bocagei*). The hydrodynamics of the configurations tested (VSF-A; VSF-B) were analyzed using a 3D computational fluid dynamics model. The main hydraulic parameters were adjusted to exceed turbulent thresholds set for cyprinids species: VSF-A and VSF-B varied in water depth (0.55 m and 0.80 m), while both were set up at higher threshold values of slope (15,2 %), head drop between the pools (Δh= 0.28 m) and volumetric dissipation power (Pv > 150 Wm-3) than those reported for cyprinids in the literature. Data analyses were carried out through a time-to-event approach, using motivation, transit time and ascent analysis as passage performance metrics. Results point to a selective fishway configuration, where native cyprinid passage prevailed over the invasive. In both configurations, the motivation for carp to pass was significantly lower compared to the barbel, and the ascent analysis revealed only one complete passage for carp in VSF-B, as opposed to the barbel that displayed much higher performance completing 17 ascents in VSF-A and 6 in VSF-B. Although further research is needed, overall, these findings highlight a selective passage, particularly configuration VSF-A, which prevented the invasive carp upstream movements, while allowing a successful passage for the barbel.

Session 4 – Socioeconomic impacts of invasions

SOCIAL-ECOLOGICAL NETWORKS AND BIOLOGICAL INVASIONS: A CASE STUDY OF THE INVASIVE AMERICAN MINK IN ICELAND

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Most problems we face in the Anthropocene are caused directly or indirectly by humans, including invasive species. Studying invasive species and specifically mitigating their impacts should, therefore, consider humans and the surrounding social and ecological system. Social-ecological networks (SENs) can be used to map the different social and ecological actors affected by invasive species as well as the interactions between them. Here, we will use the invasive American mink (*Neogale vison*) in Iceland as a case study to demonstrate how SENs can be applied to understand direct and indirect impacts and what opportunities they present in mitigating these. Based on published literature and semi-structured stakeholder interviews, we created a multilayer network of the Icelandic social-ecological system focusing on the invasive mink. Trophic interactions of species that are either ecologically or social-economically relevant to the mink or Iceland at large are included in the ecological network. The social network consists of relevant stakeholders affected by the mink or involved with its management, as well as the interactions between these. These two networks are linked by social-ecological interactions between stakeholders and species, such as the removal of matter from the ecosystem via hunting or the emotional wellbeing that birdwatchers derive from seeing certain species. Modelling how humans and nature interact gives insights into the functioning of social-ecological systems and allows for management options that consider multiple perspectives and contexts.

Session 1 – Risk assessment and management of invasive species

PRIORITIZING MANAGEMENT ACTIONS FOR EMERGENT INVASIVE NON-NATIVE PLANTS THROUGH EXPERT-BASED KNOWLEDGE AND SPECIES DISTRIBUTION MODELS

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Given the high number of alien plants introduced in Italy and time required to process a formal pest risk analysis, a prioritization process is necessary as an earliest action. We propose a rapid and simple methodology to prioritize the management towards the eradication, control and monitoring of emergent invasive plants, combining expert knowledge, current and future climatic suitability estimated by species distribution models (SDMs), clustering and ordination techniques, and integrating the spatial patterns into the three biogeographical regions of Italy (Alpine, Continental, and Mediterranean). Three categories of management actions were identified: Eradication, Control and containment, and Monitoring. Two priority classes were proposed for the management actions: high and low. A total of 36 alien plants have been identified. SDMs highlighted a high suitability for Continental and Mediterranean bioregions for the majority of invasive plants. Cluster analysis revealed three distinct clusters (C) with varying levels of suitability for the Italian bioregions. C1 exhibited a higher suitability across all Italian bioregions, whereas alien plants grouped in C2 predominantly featured high suitability in Mediterranean areas. Finally, C3 showed the lowest suitability values. Ordination analysis highlighted the variability in bioclimatic suitability for each alien plant within each cluster, as well as their current spatial pressure on each Italian bioregion. Lastly, a third ordination, integrating bioclimatic suitability and spatial patterns, has allowed the differentiation of management actions for each alien plant at both national and bioregional scales. Specifically, seven alien plants were earmarked for Eradication, six for Monitoring, while the remaining species were deemed suitable for Control and containment.

Our results and the methodology proposed coincide with the demand for new early warning tools, that is, to predict the location of new outbreaks, to establish priorities for eradication, control and containment, and monitoring of emerging invasive species.

Session 3 – Global change and invasions

UNRAVELING INVASION SUCCESS: A CAUSAL-NETWORK APPROACH TO LINKING MAJOR HYPOTHESES IN THE FIELD

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Numerous hypotheses attempt to explain invasion success, often focusing on biotic interactions and/or eco-evolutionary processes. However, there are overlaps in some of the mechanisms or processes proposed to explain invasion success. For instance, some hypotheses like those concerning biotic resistance (e.g., limiting similarity and Darwin's naturalization hypotheses) share the idea that species with distinct niches to the recipient community (e.g., portrayed by traits, strategies in resource use or proxies such phylogenetic similarity) would have higher invasion potential. Previous studies have combined major hypotheses into networks based on co-citation or conceptual overlaps but lack causal relationship information. To address this gap, we propose using causal networks, in which the connections (edges) between the variables (nodes) indicate hypothesized causal relationships.
We showcase examples of how to build such causal networks using six major invasion hypotheses. To do so, we first modeled the individual hypotheses as theorized causal relationships; we then combined them in one network, including all six hypotheses and, in a third step, we went more into details of population processes leading to invasion success. This bottom-up approach for building a causal network from well-known and well-defined components has the advantage that the complexity of the network can be built up bit by bit. The nodes can be given as rather specific, well-defined variables, and the exact meaning of each edge is explicitly stated. We suggest linking causal networks to an ontology providing precise definitions for the respective variables and relationships.
Causal networks can have many applications, from facilitating synthesis and serving as a foundation for advanced machine learning. Machine-readable versions connected to ontologies can enable AI tools to support causal reasoning, potentially extracting causal inferences from complex data. We are also eager to discuss further possible applications with the audience.

Session – Risk assessment and management of invasive species

INVASIVE ALIEN SPECIES: IMPROVEMENT OF UNDERSTANDING AND COMMUNICATION

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The challenges of gathering and disseminating information on invasive alien species (IAS) are widely recognized. The EU IAS Regulation acknowledges that improved communications and cooperation with a wide range of stakeholders is critical to prevent the introduction and spread of IAS. Some IAS provide both economic benefits and costs, and key stakeholders may experience more benefits than costs, or vice versa, which can lead to conflict situations. Understanding the social nature of conflict, and in particular the differences in values and attitudes among stakeholders, is thus a pre-requisite for designing effective cooperation, and this fundamentally applies to IAS management.
The overarching objective of this three-year (2019-2022) European project, proposed by the Commission, was to constructively engage a variety of stakeholders across member states, with a view to reducing the level of conflict and misunderstanding around IAS, strengthen the prevention, reduce the number of new biological invasions and protect biodiversity. Five stakeholder platforms were selected namely (1) aquatic ornamentals, (2) pet species, (3) soil transport, (4) forest ecosystems and (4) aquatic recreation - freshwater angling. Each platform contained a variety of stakeholders ranging from competent authorities, to NGOs and trade organisations. This presentation details initial stakeholder baseline surveys, platform meeting outcomes, the development and implementation of co-created IAS prevention campaigns, and lastly the evaluation of the project. Project legacy and sustainability of the campaigns are also discussed.

Session 5 – Conservation issues and biological invasions

INFLUENCE OF THE GUDGEON *GOBIO LOZANOI* ON NATIVE FISH ASSEMBLAGES IN A HIGHLY REGULATED IBERIAN RIVER BASIN

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The pyrenean gudgeon *Gobio lozanoi,* although native in the Spanish rivers Ebro and Bidasoa has been introduced into other Iberian river basins since the early xx century, presumably in the beginning due to escapes from specimens used as forage fish in trout farming.
The species has become invasive in several Iberian rivers, with impact on ecological quality, but has maintained a relatively low profile in the interests of researchers, focused on various piscivorous species introduced in Iberia since the mid xx century, whose negative impacts are more obvious. However, the gudgeon can become highly abundant and recent findings have provided some evidence on the opportunistic behaviour of the species, whereas others have referred the possibility of the gudgeon to influence native species, particularly in hydrologically altered rivers.
In this study, fish samples taken regularly from 2011 to 2022 in several river reaches in a Portuguese river basin (Cávado), highly regulated and invaded by the gudgeon were used to assess major factors influencing fish assemblages. More specifically, 22 river reaches were sampled with electrofishing from 3 to 12 times during 12 years, including sites with variable degrees of regulation and different states of gudgeon invasion. Assemblages with high abundance of gudgeon were distinct from other fish assemblages in the Cávado basin, with relations between gudgeon and native species capture-per-unit-of-effort (CPUE) showing both positive (e.g. *Achondrostoma oligolepis*) and negative (e.g. Iberian barbel, *Luciobarbus bocagei* and northern Iberian chub *Squalius carolitertii*) directions. Evidences of the influence of pyrenean gudgeon on native species were stronger in a river stretch that was invaded during the study when compared with a stretch already invaded since 2011.
The results from the present observational study, although preliminary, clearly indicate the need to better assess the effect of gudgeon invasion on native fish assemblages in Iberia.

Session 4 – Socioeconomic impacts of invasions

BURGEONING NON-NATIVE SPECIES PRODUCTION HINDERS SUSTAINABLE AQUACULTURE

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Rising global food demands have led to unprecedented aquaculture growth. Aquaculture has simultaneously become a major global pathway for biological invasions. Non-native farmed species, while highly productive, can undermine sustainability agendas because of their environmental and socio-economic damages when they escape. We analyse global non-native production among farmed species and quantify monetary biological invasion costs. Globally, one third of the 544 species used in aquaculture have been farmed in their non-native range, totalling 539 million tonnes with an economic value of USD 1.1 trillion. Algae and fishes dominated non-native production, yet the rate of increase in non-native crustacean production had the most rapid growth, surging over 3000% since 2000, a large contrast to the growth rates recorded from 1980 to 2000. The 25 non-native farmed species with reported monetary costs have caused up to USD 10 billion costs globally. To address the rising threats of biological invasions triggered by aquaculture escapees, a paradigm shift by enhancing biosecurity and promoting sustainable use of native resources is needed.

Session 3 – Global change and invasions

QUANTIFYING THE MAGNITUDE OF BIOLOGICAL INVASIONS USING TOTAL BIOMASS

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Biological invasions rank among the greatest anthropogenic threats to global biodiversity and ecosystem functioning, yet measuring and comparing their relative magnitudes across regions and taxa pose significant challenges. This absence of a unified metric hinders scientific advancement, public awareness, and policy development. We propose a simple, standard metric to quantify and communicate the magnitude of biological invasions: total biomass of non-native species. This metric approximates the amount of native biomass displaced, consumed, or replaced by the populations of invasive species. We illustrate how this metric can be applied to different research themes and contexts such as temporal and spatial invasion dynamics, management strategies, and invasion forecasts. We discuss the advantages and limitations of the metric, as well as the data requirements and assumptions involved in its estimation. The total biomass can provide a common currency to assess the magnitude of biological invasions, facilitating comparisons, syntheses, and innovations across invasion science.

Session 3 – Global change and invasions

A NEW PERSPECTIVE ON THE BIOGEOGRAPHY AND MACROECOLOGY OF BIOLOGICAL INVASIONS IN THE ANTHROPOCENE

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Biological invasions have become a defining feature of global environmental change. However, the patterns and underlying factors that determine variation in invasions world-wide are still insufficiently understood. Similarly, future trajectories of biological invasions and the consequences for biodiversity conservation are not fully appreciated. Progress in data availability, supplemented by new tools for data integration and analyses have facilitated the compilation of comprehensive databases of world-wide alien species distributions such as GloNAF (https://glonaf.org/) for vascular plants. Similarly, the compilation of the Alien Species First Record-database provided a backbone for analysing spatio-temporal patterns of alien species accumulation. Further, data on human pressures, on the exchange routes of goods and people, and on a wide range of environmental factors have increasingly become available. Combined, these novel data sources have substantially advanced the understanding of the macroecology and biogeography of biological invasions. Here, we will synthesize new key insights into global patterns and drivers of biological invasions. We will highlight likely future trajectories of biological invasions, discuss main gaps of scientific knowledge, and identify new avenues to improve the understanding of alien species spread and impacts. Finally, we will discuss priority questions for biogeography and macroecology related to biological invasions.

Session 4 – Socioeconomic impacts of invasions

ECOSYSTEM SERVICES AND DISSERVICES PROVIDED BY AN INVASIVE SPECIES – THE CASE STUDY OF THE MANILA CLAM IN THE TAGUS ESTUARY

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Invasive marine species can affect human well-being not only positively (ecosystem services: ES), but also negatively (ecosystem disservices; EDS), due to their impacts on biodiversity, ecosystem structure, and socio-economy.
Although ES have become a highly recognized research area, with well-defined classification systems (e.g. CICES - The Common International Classification of Ecosystem Services), the importance of quantifying EDS is increasingly recognised.
In this work we identify and quantify, through literature review and data collection in experiments and surveys, the ES and EDS provided by the invasive species Manila clam (*Ruditapes philippinarum*) in the Tagus estuary, Portugal, using an adaption of the CICES which encompasses ES and EDS and their respective trade-offs.
We found that Manila clam is an important food source, due to its great abundance in the Tagus estuary. However, most of the harvesting activities are illegal, unreported and unregulated fisheries, requiring additional enforcement efforts, this is therefore considered a disservice (EDS). Furthermore, this species led to a decrease in the abundance of native bivalves with greater commercial interest.
The Manila clam provides higher regulating and maintenance services as other native filter-feeding bivalves (e.g. removing nutrients from the environment, or toxin removal), but also higher EDS like biological contamination. This result from the large abundances and distribution and the high fishing effort.
The cultural services associated with this species are difficult to distinguish from other species of clams because of his general similarities. However, there is a negative perception of the Manila clam in areas with high intensity of harvesting activities, mainly security and safety perceptions, that can lead to a reduction of the intellectual and physical interaction with nature and opportunities for physical outdoor activities.

Session 1 – Risk assessment and management of invasive species

NORDIC RACCOON DOG MANAGEMENT 2010–2023 — SUCCESSES, FAILURES, AND THEIR ASSOCIATED REASONS

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In Finland, over 200 000 raccoon dogs were shot in 2016 as a result of 9 100 individuals being released in the former Soviet Union 1929-1955. Raccoon dogs are now found in all of Finland, including Finnish Lapland. In Sweden, the first reproduction was confirmed in 2006, close to the Finnish border in northern Sweden.

To prevent a similar population development as in Finland, the Swedish Environmental Protection Agency approved the first management and research funding 2008-2010, to develop effective methods to manage the new species. We soon realized that Sweden would not be able to stop the invasion single handedly. Apart from the already ongoing immigration from Finland in northern Sweden, the Danish population was also threatening to invade from the south. In Denmark, raccoon dogs were however still only confirmed on the mainland, Jutland, connected to Germany, not on the Isles closer to Sweden. This, combined with the limited immigration in the north of Sweden, made it feasible to stop the raccoon dog from establishing all over Sweden and Norway, as well as Denmark. We applied for, and were approved, a LIFE+ project, LIFE09 NAT/SE/ 000344 - MIRDINEC. The project implemented the hunting methods used in the Finnish management and the new management measures developed in Sweden. After LIFE, 2013 – present, the management has continued with national funding in all four countries.

In this paper we describe the raccoon dog management, and its related results, in our different countries 2010-2023. While Sweden has gone from 100-200 to less than 20 raccoon dogs (total counts), Denmark has gone from 100-200 (total count) to 7 000 – 10 000 raccoon dogs shot annually! Where lies the difference? We have used our still ongoing transnational raccoon dog project as a case study to disentangle the reasons behind both successes and failures.

Session 6 – Pathways and dispersal of invasive species

BALANCING THE RESTORATION OF A NATIVE FISH AND THE RISKS OF HITCH-HIKING INVASIVE SPECIES

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Reintroducing a species to an area where it is locally extinct may contribute to reestablishing a healthy and genetically diverse ecosystem. However, we show that such reintroductions can pose a risk to biodiversity by introducing hitch-hiking invasive alien species and pathogens together with the donor population. This risk was caused by more severe impacts of invasive species and pathogens in the habitat of the donor population than the receiving environment.

The freshwater resident Atlantic salmon in Sweden's River Klarälven perform feeding migrations to Lake Vänern. The upper part of the watershed, in Norway, lost its salmon population due to hydropower development that obstructs upstream migration. We conducted a risk assessment of the potential negative impacts on native biodiversity and ecosystems from invasive species and pathogens associated with reintroducing Atlantic salmon into the Norwegian part of the watershed by importing adult salmon spawners. This assessment is crucial due to differences in the development of invasive species and pathogens in the Swedish and Norwegian parts of the watershed. The risk of impacts was evaluated for invasive species, parasites, bacterial pathogens, and viruses that are likely present in the lower part of the watershed.

We found a high risk of negative impacts associated with the parasite *Gyrodactylus salaris*, viral hemorrhagic septicemia virus (VHSV), crayfish plague, *Renibacterium salmoninarum* causing bacterial kidney disease, and *Tetracapsuloides bryosalmonae* causing proliferative kidney disease. In addition, 20 invasive species and pathogens were associated with a medium risk and three with a low risk. The case study contributes to a deeper understanding of how reestablishing locally extinct or diminished species can influence biodiversity conservation efforts and the health of aquatic ecosystems, underlining the importance of comprehensive planning in restoration projects. We highlight the importance of risk assessing invasive species when considering the reintroduction of native species or dam removal.

Session 1 – Risk assessment and management of invasive species

THE EFSA METHODOLOGY FOR ENVIRONMENTAL RISK ASSESSMENT FOR INVASIVE PLANT PESTS

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The European Food Safety Authority (EFSA) proposed the first Environmental Risk Assessment (ERA) methodology in 2011, emphasizing the importance of considering the consequences caused by invasive pests on both the structural (biodiversity) and the functional (ecosystem services) aspects. Recently (2018) the whole pest risk assessment approach was revised by EFSA to ensure quantitative, transparent, comparable, and fit-for-purpose results. This requires a revision of the ERA methodology where the ecological mechanisms involved in the impact on biodiversity and ecosystem services are captured and integrated in the quantitative assessment.

The EFSA-ERA methodology is based on the following steps: i) definition of the spatial and temporal scales of the assessment; ii) identification of ecosystem types potentially impacted by the presence of an invasive pest; iii) characterization of the factors driving the impacts, such as pest population pressure and relative importance of host plants; iv) identification of the link between the impact on the host plants, ecosystem traits and services that are affected; v) calculation of the change in selected ecosystem services flow; vi) calculation of the impact on biodiversity at the community level, and on protected species and areas (e.g.: Natura2000 sites), vii) integration of the impacts on the assessed ecosystem services and biodiversity elements in composite indexes, viii) development of new probability models and statistics risk assessment indicators.

Here, we present the new framework that has been tested on more than 20 pest species and validated with the support of an international group of experts. Although originally targeted to plant pests, we suggest that the approach could also be tested for other invasive alien species.

Session 3 – Global change and invasions

INSULARITY AND TROPHIC POSITION SHAPE NEGATIVE AND POSITIVE IMPACTS OF ALIEN UNGULATES ON NATIVE BIODIVERSITY

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Alien species cause diverse environmental impacts worldwide. While considerable attention has been devoted to documenting and predicting the substantial harms inflicted by some alien species, particularly invasive ones, on native biodiversity, the study of their positive impacts remains largely unexplored. For instance, the degree to which alien species benefit native species through food provision or dispersal facilitation, and the circumstances under which this occurs, have not been thoroughly examined. Here we employ the IUCN Environmental Impact Classification for Alien Taxa (EICAT) framework, along with its complementary version, EICAT+, to assess the number and magnitude of negative and positive environmental impacts of alien ungulate species on a global scale. By categorizing impact magnitude into two levels of strength (weak and strong), we also ask whether insularity and trophic position of species affected by alien ungulates influence both their negative and positive impacts. Of the 29 alien species of ungulates found to cause impacts, totalling 2,021 impact observations, a predominance of negative impacts (1,615) was observed, which also exhibited a greater magnitude compared to positive impacts. Notably, native species from insular locations experienced stronger impacts than those located on the mainland, a pattern consistent across both negative and positive impacts. Furthermore, regardless of impact direction, alien ungulate species were more likely to cause strong impacts through indirect mechanisms compared to direct ones, particularly affecting secondary consumers over primary consumers. The combined use of EICAT/+ enabled us to conduct a taxonomically controlled bidirectional assessment of impacts that had never been attempted before. By providing novel insights into the multifaceted influence of alien species to global change, our research can assist policy decisions on biodiversity conservation, particularly in island contexts and for species occupying high trophic levels.

Session 6 – Pathways and dispersal of invasive species

GRAVEL-BED RIVERS IN THE SOUTHERN HEMISPHERE – A GLOBAL HOT SPOT FOR INVASIVE PLANT SPECIES

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Gravel-bed rivers are characterized by extensive open habitats. They therefore provide opportunities for both native and non-native plant species to colonize and establish. In addition, rivers are natural dispersal routes for seeds and plant parts, making them vulnerable to the spread of invasive plant species. A global evaluation of the occurrence of typical floodplain plants in mountain rivers showed that rivers in the southern hemisphere, such as those in New Zealand and Patagonia, are particularly affected by the increased occurrence of invasive plant species. Even as succession progresses, the absence of native pioneer woody plants is typical of such sites. Non-native pioneers of the northern hemisphere, including the genera Populus, Salix, Myricaria, and Tamarix, can establish themselves in these open niches. These species are considered invasive and can significantly impact floodplain communities and river morphology. In the frame of a global data analysis, we analysed the invasion strategy of plants in gravel-bed rivers in the Chilean Andes of northern Patagonia, focusing on *Salix fragilis* as an example. We analysed site and vegetation data and used dendrochronological studies of *S. fragilis* and the common native woody species. This allowed us to identify patterns of niche position of all woody species along a hydrogeomorphologic gradient, niche widths, and growth rates. According to the results, *S. fragilis* grows faster than the native species (especially in the juvenile stage) and is better adapted to sites that are strongly affected by morphodynamics. Based on the assessment of the dispersal factors of *S. fragilis*, its current and potential distribution patterns in northern Patagonia are presented. Gravel-bed rivers contribute significantly to global biodiversity. The findings of the research help to understand the impact of invasive alien plants in terms of their ecological-functional effects and to be able to take measures to manage them.

Session 5 – Conservation issues and biological invasions

ETHICAL DILEMMA IN CONSERVATION: A TROLLEY PROBLEM THOUGHT EXPERIMENT

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As a field focused on decision-making applied to complex systems, conservation must not only account for scientific predictions, but also integrate societal values, ethical systems, and diverse perceptions. Divergence about the morality of conservation actions resulting from a combination of these elements can lead to conflicts between stakeholders and dilemmas, and identifying points of contention, or why people may agree or differ for different conservation situations (e.g. trophy hunting and biological invasions), can be difficult. Here we adapt the well-known trolley problem thought experiment to a conservation context to offer a simplified yet comprehensive framework enabling us to explore possible factors contributing to value conflicts. Through the development of variations covering key concepts such as asymmetry of numbers, victims and impacts, temporal and spatial considerations, uncertainty, as well as causal relationships between actions and consequences, we provide a structured approach to elucidate moral conflicts in conservation. The trolley problem's versatility allows for the exploration of multiple scenarios deriving and combining these key concepts, facilitating a deeper understanding of the complexities inherent in conservation ethics. While acknowledging the need for contextualization and refinement, the conservation trolley problem also serves as a foundational step towards developing more nuanced through experiments tailored to specific conservation contexts. The presented framework offers a systematic method to compare and analyse diverse ethical perspectives, fostering communication and facilitating informed decision-making in conservation practice. The integration of diverse metaphors offers avenues for enhancing dialogue between stakeholders, broadening perspectives, and advancing ethically sound conservation practices.

Session 3 – Global change and invasions

NEW FISH INTRODUCTIONS IN A TROPICAL LAKE COULD UNLEASH INTEROCEANIC INVASIONS IN THE AMERICAS

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For over a century, the Panama Canal in Central America has played a major role in global maritime shipping connecting the Atlantic and Pacific oceans. Historically, marine species introductions through the Panama Canal have been relatively low, largely due to the existence of a soft barrier (the freshwater Lake Gatun) inside the canal. The 2016 expansion of the Panama Canal involved significant structural changes to the canal's lock system that seem to have increased the likelihood of marine species entering and eventually crossing the canal. To understand the magnitude of fish compositional changes observed after the 2016 canal expansion, we surveyed the fish communities of Lake Gatun immediately before (2013 – 2016) and after (2019 – 2023) the expansion using standardized quantitative methods. We observed a consistent shift from a freshwater-dominated to a marine-dominated fish community in several areas inside the lake. Our data reveals that the fish biomass composition of Lake Gatun has changed from being dominated by the introduced freshwater Peacock Bass to a dominance of five marine, mostly large-bodied predatory, fish species. The ongoing invasion at the Panama Canal suggests that some of these marine species could eventually pass through the canal and colonize the opposite ocean. Given that most of these marine fishes are top predators, their successful invasion could bring major ecological changes in the new colonized areas.

Session 6 – Pathways and dispersal of invasive species

PREDICTING THE NEXT ALIEN SPECIES – AN IMPOSSIBLE TASK?

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Predicting biological invasions remains one of the holy grails in invasion ecology. Several attempts exist to predict the spread of alien species and to determine the next potential invader. Such knowledge is essential to prevent biological invasions, where possible, and to prepare for the next potential invasive alien species, when prevention fails. However, the complexity of the process and the high uncertainty involved seemed to render predicting biological invasions a very challenging task. The process of biological invasions may even appear unpredictable. In my presentation, I will outline why I believe that predicting biological invasions should be indeed possible if using appropriate tools and data. The process of spread of alien species seems chaotic but the underlying dynamics are deterministic and thus predictable. But there is currently no model existing, which is capable of simulating the full process of alien species spread from species' native (or current) range over transport dynamics and establishment and spread within the new range. Existing models are limited in scope by addressing just individual parts of the process. In addition, existing models are usually not capable to address changes over time and thus to predict past and future dynamics. In the coming years, I will combine the individual components to develop a novel comprehensive model to simulate the spread of alien species and how it changes over time. I will outline how open data sources such as openstreetmap in combination with maritime shipping data, simple models of transport and environmental data will be used to form a global human transport network, which will form the backbone for the simulation of alien species spread. Such a model will allow us to test hypotheses of spread at large scale and to improve our understanding of how ecological communities shape in the Anthropocene.

Session 1 – Risk assessment and management of invasive species

ASSESSING AND MAPPING THE CUMULATIVE IMPACT OF INVASIVE ALIEN SPECIES – THE NEW CIMPAL INDEX E-TOOL WORKFLOW

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CIMPAL is a standardized, quantitative index developed to assess the Cumulative IMPacts caused by invasive ALien species (IAS), map their impact footprint and spot the vulnerability of natural habitats to biological invasions. Cumulative impact scores are estimated based on the distributions of IAS and ecosystems, considering both the reported magnitude of impacts and the strength of such evidence. Impact quantification focuses on biodiversity and environment but is extensible to ecosystem services or other type (e.g., health, economic). CIMPAL allows to prioritise species for management using complementary impact indicators. A new CIMPAL algorithm implementation took advantage of cloud computing resources to integrate and process large datasets and perform regional or global scale assessment at high spatial resolutions (meters). Computation now accommodates both point data as well as polygon data (distribution ranges). Also, the impact weight is considered according to the surface overlap between habitats and species distribution with the option of considering a species dispersion radius; a new user-tailored feature based on species mobility traits, convenient for point data calculations and data poor areas. Spatial aggregation of high-resolution results can be done a posteriori with integrated zonal statistics tools. This workflow offers flexibility to accommodate any impact assessment protocol, use any habitat classification, being applicable to both marine and terrestrial ecosystems, to perform multi-species assessments, as well as capability to aggregate the cumulative impact scores according to user needs. The CIMPAL e-tool webservice implemented as a friendly GUI under LifeWatch-ERIC, the European e-Science Infrastructure for Biodiversity and Ecosystem Research, speeds-up and facilitates reproducibility of the assessments, while offering a flexible tool to study and visualize the cumulative negative impact caused by IAS. Our research is committed to reduce the lag between scientific knowledge and IAS management and control by decision makers and managers.

Session 3 – Global change and invasions

POTENTIAL DISTRIBUTION, OBSERVED IMPACTS, AND INVASION RISK OF TWO NON-NATIVE SNAPPING TURTLES, *CHELYDRA SERPENTINA* AND *MACROCHELYS TEMMINCKII*

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Among reptiles, turtles are the most frequently traded species, and are often released in the wild once they become unwanted as pets. The common snapping turtle *Chelydra serpentina* and the alligator snapping turtle *Macrochelys temminckii* are freshwater turtles native to North America. Although their trade is regulated in some countries, they have been introduced worldwide as pets. While *C. serpentina* has already some established self-sustaining populations outside its native range, there are no such reports for *M. temminckii*. However, there are increasing records from the wild for both species, yet a thorough assessment of the potential climatic suitability, observed impacts, and potential invasiveness of these two species has never been performed. To fill this critical gap, we combined Species Distribution Models (SDMs) under current and future climatic scenarios, standardized scoring impact systems (EICAT(+) and SEICAT), and invasiveness risk-screening (AS-ISK). Our results show climatic suitability, current and future, for both species outside their native range, wider in *C. serpentina*. In their native ranges, our models predicted a future increase in climatic suitability for *C. serpentina*, but a decrease for *M. temminckii*, raising potential concerns for the conservation of this latter species. Only *C. serpentina* could be assessed for its impacts, being attributed a minor impact score. The invasiveness risk screening attributed a medium risk to *C. serpentina* and a low risk to *M. temminckii*. In any case, our results suggest that proper data collection outside both species' native ranges are necessary to monitor the status of these as non-native species.

Session 1 – Risk assessment and management of invasive species

NON-NATIVE SPECIES IN TAGUS RECREATIONAL MARINAS: WHICH FACTORS ARE MORE RELEVANT TO THE ESTABLISHMENT? STATUS, TRENDS AND MONITORING

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Increasing global trade, coupled with the absence of effective monitoring and management methods, will lead to a larger impact of Non-Native Species (NNS) in the ecosystems where they are introduced. To develop appropriate monitoring programs for NIS temporal trends it is crucial to understand the influence of different factors (e.g. salinity, temperature, distance to other introduction vectors), for the successful establishment and detection of NIS. Therefore, this study aims to better understand key underlying factors behind NIS distribution along an estuarine gradient, clarify which factors contribute to settlement success, and provide monitoring tips to maximize detection efforts. To achieve this, four recreational marinas located along the Tagus estuarine gradient in 2016 and 2021, using different sampling efforts (24 and 4 replicates, respectively) and two different periods (spring and summer, respectively). There was an increase in richness and percentage cover from 2016 to 2022 for both native and NNS species. The results suggest an increase of the number and abundance of NIS, but seasonal effects cannot be excluded, indicating that summer may be the most suitable sampling season for the detection of the maximum number of species. The results based on different sampling efforts indicate that there is no minimum number of replicates required for effective monitoring in the Tagus estuary since there is no stabilization of the new records with an increase in the number of samples collected. Temperature, salinity, dissolved oxygen (%), marina area (m^2), and marina opening length (m) were the significant factors, showed by the ordination of the NNS community, for the establishment and distribution patterns These results emphasize the need to implement consistent methodologies, for example in the MSFD, to ensure comparable monitoring outcomes across different locations.

Session 6 – Pathways and dispersal of invasive species

CAN *SOLIDAGO* SPP. IMPEDE THE ESTABLISHMENT OF A RIPARIAN FOREST ON A RESTORED RIVER SECTION? – FINDINGS FROM THE VEGETATION MONITORING AT THE LOWER TRAISEN RIVER (AUSTRIA)

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The establishment of invasive alien plants (IAP) is a particular problem in the context of river restorations and the associated creation of large open areas. Plant species adapted to germinate on open gravel and sand bars such as the typical softwood riparian forest species of Central Europe, willows and poplars, depend on the recurring creation of these sites. However, it is assumed that the dense growth of IAP could prevent the germination and establishment of these tree species. These assumptions were investigated using the data of an exemplary case study of the Traisen River (Austria) shortly before it flows into the Danube. In the context of a European Life+ project, a non-regulated riverbed for the Traisen was created within a 9.5 km long artificially lowered corridor. The overall objectives of the measure were the natural establishment of riparian vegetation and the reconnection of present floodplain biocoenoses to the river processes. In the context of a comprehensive vegetation monitoring from 2014 to 2021, the vegetation succession on the different habitats was documented. The analyses presented here focus on floodplain forest development by the softwood riparian forest species *Salix alba*, *Populus nigra* and *P. canescens* next to the establishment of the alien goldenrod species *Solidago gigantea* and *S. canadensis*. The long-term vegetation monitoring revealed that the tree species germinated on approximately 62% of the study area during the monitoring period. The majority of the individuals germinated in the first year on the newly created sites. In the last year of monitoring, the alien goldenrods covered about 50% of the study area. The preliminary results indicate that the goldenrods delay tree growth when they reach dense covers of more than 80% but are not able to suppress riparian forest establishment.

Session 1 – Risk assessment and management of invasive species

US STATE INVASIVE SPECIES POLICIES LACK CONSISTENCY, NEED COORDINATION

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Invasive species critically threaten economies, native biodiversity, ecosystem function, and human and animal health. A strong regulatory framework is key to mitigating the threat of current invasive species and preventing new damaging introductions. However, the United States lacks meaningful federal laws and regulations on invasive species, leaving it to individual states. We reviewed all invasive species related laws and regulations for 21 eastern US states to evaluate their taxonomic, pathway, and habitat coverage. We identified 706 policy chapters covering 1200 unique species, of which 523 were identified as introduced/invasive. Policies covering plants and vertebrates outnumbered ones covering invertebrates, though this varied among states. Policies covering terrestrial habitats outnumbered aquatic ones, though it was more balanced in coastal states. Overall there was little overlap or consistency among adjacent states. We encourage states to coordinate efforts at the regional level to better address invasive species issues.

Session 1 – Risk assessment and management of invasive species

VEGETATIVE GROWTH AND LEAF COMPOSITION IN THE INVASIVE GRASS *CORTADERIA SELLOANA* AFTER CUTTING

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Invasive alien species represent a major threat to biodiversity and human well-being at a global scale. Understanding the mechanisms behind the success of invasive species is needed to provide the best available solutions for their management and control. In land plants, the ability of invasive species to overcome native vegetation partly explains their success, and this is related to rates of vegetative growth and propagule production. *Cortaderia selloana* is a tall grass from South America that has become one of the most prominent invasive plant species in southern Europe, with strong impacts in biodiversity, human health, and socio-economic issues. Here we show results from a manipulative experiment in which leaf growth was measured periodically after cutting at seven different moments, from February to June, we found that the final leaf length and growth rate were constrained by the interaction between cutting moment and flowering. Leaf growth and flowering partly explained differences in specific leaf area (SLA), leaf total nitrogen and silica accumulation. These results depict flexible trade-offs in *C. selloana*, a species able to adapt its acquisition strategy and leaf composition to exogenous stress factors such as cutting.

Session 6 – Pathways and dispersal of invasive species

SEED TRANSPORT AND LANDSCAPE MODELLING TO PREDICT RIPARIAN PLANT INVASION HOTSPOTS

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Invasion by *Impatiens glandulifera* along riparian corridors has been attributed to a range of negative effects including increased riverbank erosion and decreased native plant and invertebrate diversity. *Impatiens glandulifera* exhibits a heterogenous distribution across a catchment depending on local flow regime and its success is attributed to hydrological connectivity and sustained high propagule pressure. Thus, understanding the contemporary and near-future distribution of *I. glandulifera* under climate and land use change is critical in determining the rate of spread and predicting invasion hotspots.
Difficulties associated with in-situ seed tracking make it challenging to understand seed transport dynamics. In this study, we characterised seed morphology (e.g., seed width and density) and fluvial transport behaviour (e.g. settling velocity), of *I. glandulifera* seeds (n = 1350) along an elevation gradient consisting of three source population areas. We show that *I. glandulifera* seed source areas, e.g. upper catchment vs. lower catchment, showed differences in seed traits and transport behaviour. To track the transport of seeds across the catchment, under various climate scenarios, *I. glandulifera* source areas were incorporated into a landscape evolution model (CESAR-Lisflood). We found a significant difference in propagule pressure depositional intensity between different catchment source areas, corresponding to invasion hotspots and estimated minimum transport distances of ~1.2 km to ~ 2.5 km from seed release to germination.
We demonstrate that *I. glandulifera* spread is a non-linear process in which seed transport occurs during discrete periods. Our results highlight the role of hydrology and seed trait differences in determining *I. glandulifera* invasion hotspots. The outputs of this study can contribute to our understanding of water mediated *I. glandulifera* seed dispersal, enabling more target management activities.

Session 1 – Risk assessment and management of invasive species

TEMPERATURE-DEPENDENT IMPACT PREDICTIONS FOR THE INVASIVE NARROW-CLAWED CRAYFISH (*PONTASTACUS LEPTODACTYLUS*) RELATIVE TO THE SIGNAL CRAYFISH (*PACIFASTACUS LENIUSCULUS*), AND PREDICTED RANGE ALTERATIONS UNDER CLIMATE CHANGE

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Invasive species disrupt trophic interactions and destabilise ecosystems. Crayfish, polytrophic omnivores, are particularly damaging invaders. Narrow-clawed crayfish (*Pontastacus leptodactylus*) are an emergent invasive species, with limited data regarding their potential ecological impacts. Predicting ecological impact in current and future climate conditions is essential to inform policy and management actions. Therefore, we determined temperature dependent predation (9°C 12°C, 17°C, 22°C) of *P. leptodactylus* compared to the comparatively well studied signal crayfish (*Pacifastacus leniusculus*) on *Gammarus pulex*. We also used species distribution models to predict future range change of *P. leptodactylus* across Eurasia. Both species exerted strong predatory impact on *G. pulex* at all temperatures, however, when field abundance was considered *P. leniusculus* have a higher relative impact driven by higher field abundance. The range of *P. leptodactylus* was predicted to increase and shift northwards. Our findings indicate *P. leptodactylus* potential as a widespread damaging invader, both currently and in the future.

Session 6 – Pathways and dispersal of invasive species

WINNERS AND LOSERS: SHORT-TERM DYNAMICS OF ALIEN SPECIES IN THE SOUTH AFRICAN SAVANNA IN KRUGER NATIONAL PARK

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Plant invasions in African savannas have been less studied, perhaps because they are thought to remain relatively natural, especially in protected areas that act as a barrier against alien species. Even less is known about the temporal dynamics of species, i.e. whether species once recorded persist or disappear. To fill this gap, we explored the fine-scale dynamics of alien species occurrence over 4–5 years in the South African savanna, Kruger National Park. We were particularly interested in (i) how much the total number of alien species fluctuates, (ii) how habitat affects the stability of alien species occurrence, and (iii) how stable the populations of individual species are.
We recorded all alien plant species in 2019–2020 and again in 2024 in a representative set of sixty 50 × 50 m plots in the Kruger National Park, South Africa. The plots were located in three habitat types: at perennial rivers, at seasonal rivers and on dry crest along a gradient of water availability. Differences in alien frequencies of occurrences were tested using generalized mixed-effect models.
We recorded comparable numbers of aliens in the first sampling in 2019 – 2020 and in the second sampling in 2024. However, the number of aliens differed significantly between habitats: perennial rivers harboured highly significantly more aliens than seasonal rivers or crests. *Achyranthes aspera*, *Conyza bonariensis* and Senna septentrionalis, which were relatively rare in the first sampling increased significantly in their frequencies, while *Melanthera scandens*, *Mollugo nudicaulis* and *Tridax procumbens* decreased. The majority of the species (20 out of 26) did not change significantly in their frequencies, indicating their good persistence. The spread of *Conyza bonariensis* could potentially become a serious conservation problem, as it spreads on crests that are still little invaded.

Session 4 – Socioeconomic impacts of invasions

UNITING SCIENCE AND LOCAL COMMUNITIES EFFORTS TO ADDRESS THE SIGNAL CRAYFISH (*PACIFASTACUS LENIUSCULUS*) THREAT IN MONTESINHO PARK

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The invasion of the signal crayfish (*Pacifastacus leniusculus*) in Montesinho Natural Park (MNP), Portugal, poses a significant threat to the local freshwater ecosystems and their biodiversity, which are of great environmental, economic, and cultural importance. This study assesses the impact of this invasive species and integrates scientific methods with local knowledge, focusing on six rivers: Baceiro, Rabaçal, Tuela, Sabor, Fervença, and Mente. By conducting interviews with 110 residents living near these rivers, with equal representation of genders, the study captures perspectives on the presence, dispersal and impacts of the signal crayfish populations. Notably, 46% of men and 25.5% of women reported observing the crayfish, with initial invasions dating back approximately 8 and 5.8 years, respectively. A significant majority—78.6% of men and 80% of women—believe that the crayfish populations have grown substantially since then. The impact on ecosystem services was evaluated on a scale of 0 to 5, where 5 represents the most severe impact, highlighting effects on riverbank erosion (1.5), food sources for humans (2.5) and other species (3.8), water quality (3.3), pest regulation (3.0), habitat provision (3.9), and recreational and tourism services (2.8). Both men (87.5%) and women (77.8%) indicated that brown trout *Salmo trutta*, in particular, has been the most adversely affected species by the invasion. However, empirical studies showed that invertebrates seems to be the most negatively affected taxonomic group of organisms. There is unanimous consensus on the need to integrate local knowledge with scientific data to improve management strategies for controlling invasive species. This research underscores an urgent need for thorough scientific studies and tailored management approaches to mitigate the negative impacts of the signal crayfish, highlighting the vital role local communities play in creating knowledge and developing strategies to safeguard the MNP's biodiversity and ecosystem services.

Session 3 – Global change and invasions

IS THE ENEMY OF YOUR ENEMY ANOTHER ENEMY OF YOURS? THE QUAGGA MUSSEL REPLACES THE ZEBRA MUSSEL IN INVADED AREAS: HOW AND WITH WHAT CONSEQUENCES?

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The invasive zebra mussel, *Dreissena polymorpha* (ZM), is being replaced by a more recent invader, the quagga mussel, *D. rostriformis bugensis* (QM) in Europe and North America. We checked life history, behavioural and physiological differences between the dreissenids to reveal drivers of this displacement. Our experimental and field studies revealed that: (1) QM grow faster than ZM, including faster soft tissue weight increase per unit length; these differences become more pronounced at low food concentrations. (2) ZM condition deteriorates after the appearance of QM. (3) QM accumulate more lipids at low than at high food concentrations, and than ZM; this suggests a metabolic shift that allows QM to replace the missing storage materials (carbohydrates) and may allow QM survival and growth in harsh conditions. (4) QM accumulate more glycogen and have higher caloric content than ZM. (5) QM have lower attachment and shell strength (anti-predator resistance) than ZM, especially at young age. (6) Predators preferentially prey upon QM. (7) QM more often detach from substrate, but, when detached, move less than ZM. (8) QM are less selective for habitat than ZM; in particular, in contrast to ZM, QM do not avoid attachment to mussel shells (including those of QM and ZM), and more often form aggregations (9) QM show lower physiological stress (superoxide dismutase expression) than coexisting ZM. (10) QM exert a lower fouling pressure on unionids than ZM because of the more common detachment of QM from initial sites. Thus, QM are better competitors, especially under harsh environmental conditions, due to their higher starvation tolerance, faster growth, lower habitat selectivity, lower energy expenditure for site selection, but despite greater susceptibility to predation. However, negative environmental impact of QM seems lower than that of ZM due to their weaker fouling pressure and providing molluscivores with food of better quality.

Session 6 – Pathways and dispersal of invasive species

ASSESSMENT OF THE LEVEL OF SPREAD OF ALIEN FOULING SPECIES FROM PORTS TO NEARBY AREAS

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In the marine environment, monitoring of alien species is mostly focused on high-risk sites for introduction, such as ports, while the assessment of the alien species spreading outside ports is still poorly investigated. This study aimed to compare fouling communities from artificial substrates inside (docks) and outside (boulder seawalls) marinas, to assess the level of spread of alien species over short distances. The study was conducted at four sites in the Ligurian Sea (Italy; NW-Mediterranean). Three sites (Fezzano, Le Grazie and Santa Teresa) were sampled in July 2021, while one site (Varazze) was sampled in July 2022. Ten samples per site (i.e., five inside and five outside the marina) were collected in snorkeling by scraping the biological material on the vertical surfaces at 1 m of depth, within a reference quadrat sized of 14x14 cm.
A total of 21 alien species were recorded in the four sites, with a minimum of three outside the Varazze marina and a maximum of 11 outside the Fezzano marina. The number of alien species was significantly different among sites but not between substrates. In fact, considering the cumulative number of alien species recorded inside and outside each marina, comparable values were detected and in two sites the values were slightly higher on boulder seawalls than on docks. Additional sampling should be conducted at increasing distances from the selected marinas to better understand the level of spread of fouling alien species outside their introduction site, and possibly even in natural habitats.

Session 6 – Pathways and dispersal of invasive species

EXOTIC AND INVASIVE INVERTEBRATES IN EUROPE'S FRESHWATERS: A PAN-EUROPEAN OVERVIEW

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Freshwater invertebrates represent a highly diverse group in Europe, encompassing over 15,000 species. While some country-specific syntheses exist on the introductions of invertebrates, they are infrequent and have not been conducted simultaneously or with consistent definitions for this group. We present the first European synthesis of exotic invertebrates, enabling spatial and temporal analysis of their patterns of introduction and dispersion in inland waters. A total of 153 species have been documented in the literature, with each species considered as present in one of the 40 European countries when clearly mentioned in publications. The date of the initial observation or report was recorded for each species. Subsequently, this original database was then cross-referenced with publicly available GBIF data. The analysis of these two sources of information (literature and GBIF data) allows for an analysis by taxonomic group and bio/ecological profile, revealing the prevalence of mollusks and crustaceans, as expected. The spatiotemporal analysis highlights the significance of secondary dispersals beyond the initial introduction. Details of spatial distribution are discussed based on various determinants, and hotspots of xenodiversity are identified.

Session 5 – Conservation issues and biological invasions

INCORPORATING LOCAL INSIGHTS THROUGH INTERVIEWS AND A PARTICIPATORY WORKSHOP FOR INVASIVE SPECIES MANAGEMENT IN SOUTHEASTERN IBERIAN ARID ECOSYSTEMS

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Effective Invasive Alien Species (IAS) management requires understanding ecological impacts and stakeholder perceptions, yet these are limited in arid and semiarid ecosystems. We tackled this using the Southeastern Iberian Peninsula as a study case. We conducted over 35 semi-structured interviews across the region and a participatory workshop in the Guadalfeo river watershed, gathering insights from diverse stakeholders including land managers, officials, and specialists. Through Framework Analysis we structured the interview data into thematic categories, reflecting stakeholders' concerns and priorities. This, along with species prioritization during the workshop, provides nuanced understanding of local management needs. Key species identified through interviews include *Cenchrus setaseus*, *Cortaderia selloana*, *Nicotiana glauca* and *Ricinus communis*, alongside invasive species such as *Arundo donax* and *Ailanthus altissima*. The latter two were also noted during the workshop for their marked socio-economic and environmental impacts on local ecosystems and agriculture in the Guadalfeo watershed. The interviews underscored urgent challenges as prioritized non-chemical control, collaborative strategies, and greater legislative enforcement to address IAS spread effectively. During the workshop, stakeholders shared their direct experiences and perceptions reaching a consensus across common challenges. Specifically, they emphasized the importance of socio-ecological approaches in resource management and the need for a coordinated long-term plan across sectors for IAS management. Finally, 17 actions were identified to tackle the challenges. By leveraging local knowledge through interviews and participatory methods, the study enhances our understanding of the dynamics at play in invasive species management and underscores the necessity for strategies that are both scientifically informed and culturally attuned. This approach can potentially ensure that management interventions and IAS plans are responsive to local needs, facilitating more effective and sustainable outcomes.

Session 3 – Global change and invasions

IMPACTS OF *IRIS PSEUDACORUS* INVASION ON THE ABUNDANCE OF MACROPHYTE SPECIES IN TIDAL WETLANDS

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Iris pseudacorus L. (yellow flag iris; Iridaceae) has invaded tidal wetlands in the San Francisco Bay-Delta Estuary (SFBDE, California, USA), reducing native wetland species richness and diversity. We analyzed the response of individual plant species to invasion of *I. pseudacorus* along an estuarine gradient in SFBDE to identify species most sensitive or resistant to the invasion. Change in absolute cover between uninvaded and invaded areas was more negative for those species maintaining higher abundance in uninvaded plots, resulting in mean covers lower than 14% in invaded plots for all species negatively affected by iris. Abundance of 12 species decreased when cohabiting with *I. pseudacorus* compared to uninvaded areas, with 2 species totally excluded from invaded areas. The most affected species by *I. pseudacorus* invasion were *Paspalum distichum* (-31 ± 8% cover), *Juncus balticus* (-26 ± 8% cover) and *Schoenoplectus acutus* (-25 ± 6% cover). The cover of all other species was reduced by less than 21%. In contrast, only 1 species had greater absolute cover when growing in close association with *I. pseudacorus* in invaded areas compared to uninvaded areas. *Festuca rubra* increased its abundance (+10 ± 7% cover) with *I. pseudacorus* invasion. These interspecific dynamics inform development of augmentative restoration strategies following managed removal of *I. pseudacorus* to restore diversity and prevent reinvasion.

Session 2 – New tools and approaches for detection and monitoring

PLATFORM NAJDI.JE: CITIZEN SCIENCE AS A VALUABLE MULTILEVEL TOOL FOR STUDY OF ALIEN INVERTEBRATES

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"Aliens attacked us – let's stop the invasion!" From a scientist's point of view, this is clearly an overstatement, however, if the study of invasive organisms uses citizen science, this may no longer be the case. However, any negative impacts can always be regulated or managed in various ways. The process could be divided into five basic categories; (1) risk assessment, (2) early warning, (3) monitoring distribution spread, (4) assessing impacts and (5) evaluating and managing success. Citizen science is mainly used for early detection or monitoring in the early stages of spread. Our NAJDI.JE platform, primarily specializing in monitoring invasive invertebrates using citizen science, is trying to change these established traditions, and we are gradually using all five categories in specialized searches.

NAJDI.JE has announced 13 special searches, with only some of them being recent monitoring, e.g. *Vespa velutina*. Thanks to these data, we have been able to find out that *Cydalima perspectalis* is still spreading more passively than actively in the Czech Republic after more than 12 years of presence. The project also includes other studies including studies of parasites in invasive true bugs or *Harmonia axyridis*. People actively send us samples, and this allows me to study much more complex aspects of the invasion biology of these uninvited guests. The furthest we have come is with direct control of the important pest *Rhagoletis completa*, where for two years people have been testing control directly in their gardens and we are able to describe in detail the differences in population dynamics between areas.

The main goal is to fulfill the five categories already mentioned, but our next aim is also to inform and educate not only all those interested in science and nature, but also those who only learn about these invaders when they destroy their crops.

Session 2 – New tools and approaches for detection and monitoring

A REVIEW OF SCENARIOS AND MODELS OF BIOLOGICAL INVASIONS UNDER THE IPBES IAS ASSESSMENT

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The importance of model and scenario-based prevention and early detection has been highlighted in several policies including the European Union Regulation 1143/2014 on invasive alien species. Modelling approaches have been used to define coarse climatic envelopes for invasive alien species, and reconstructing routes of biological invasions. Fine-scale species distribution modelling and prediction requires information on local environmental and habitat factors, as well as linking correlative models to demographic variables or demography-based population models. The prevention, early detection and management of biological invasions will consequently benefit from increased knowledge, more informative predictions, and accurate and plausible future scenarios.

For invasive alien species, scenarios and models have been applied to inform understanding of how spatial-temporal patterns emerge, of which processes are underlying these patterns, and of how ecological, economic, and societal drivers relate to the emergence of the observed patterns. Scenarios and models differ in their approach to investigate historic, current, and future patterns of alien species richness, abundance and distributions. While models aim to predict alien species patterns based on how environmental, economic or social variables relate to species occurrence or abundance, scenarios are based on alternative possible future states of those variables resulting in projections of potential future patterns of biological invasions.

A systematic review including an initial set of 30,299 research papers (of which 778 research papers were found to consider both the use of models and scenarios to evaluate the patterns and trends of invasive alien species) was undertaken by the scenarios and models' liaison group to assess the current use of scenarios and models within the context of biological invasions.

In this talk we will explore how scenarios and models in terms of how patterns and dynamics are analysed, the methods used, their different uses, and the advantages and disadvantages of each approach.

Session 2 – New tools and approaches for detection and monitoring

USING INVASION-ONLY ECOLOGICAL NICHE MODELS FOR PREDICTING THE EXPANSION OF INVASIVE SPECIES

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Ecological niche models (ENMs) are a powerful tool for predicting the spread of invasive alien species (IAS) and support the implementation of actions to reduce the impact of biological invasions. Using distribution data solely from native ranges when calibrating ENMs can underestimate invasion potential due to potential niche shifts. Conversely, combining native and invasive range data may overestimate the invasion potential due to reduced fitness and environmental tolerance in invaded areas. An alternative is to use increasingly accessible temporal series of distribution data of invasive alien species (IAS) as they expand, allowing for iterative invasion forecasting. However, while this approach accounts for possible niche shifts, it may underestimate the potential range, especially in early stages of the invasion when optimal conditions may not be fully represented. In this study, we focused on the expansion of the common waxbill (*Estrilda astrild*) in the Iberian Peninsula as our model system. Utilising distribution records in 10x10km grid cells cumulatively from 1960 to 2019, along with yearly bioclimatic variables, we constructed ENMs to project the species' potential range in the upcoming decades. Our evaluation involved assessing each model's performance for each decade in predicting the observed range expansion in subsequent decades, considering how the number of distribution records influenced the forecast quality. Additionally, we conducted dispersal estimates, incorporating species traits, topography, climate, and land cover, to analyse the models' prediction capacity, aiming to reduce uncertainty when projecting to the next decades. Our results show that invasion-only ENMs successfully forecasted the species' range expansion over three decades after invasion, whereas dispersion models were not important in forecasting common waxbill expansion. Our study highlights the importance of constantly monitoring alien species, suggesting that iterative updating of ENMs with observed distribution data may accurately forecast the range expansion of alien species.

Session: Session 6 – Pathways and dispersal of invasive species

EXPANDING THE HORIZONS OF DENIS: A GLOBAL DATABASE ON MARINE DEBRIS AND NON-INDIGENOUS SPECIES

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The accumulation of anthropogenic marine debris (AMD) continues to threaten marine biodiversity and ecosystem health due to its durability and persistent presence in global marine environments. AMD is a critical vector for the long-distance dispersal of non-indigenous species (NIS) that can alter native populations and habitats. Recent research within this domain reveals new dynamics in the interaction between AMD and NIS, emphasizing the complexity of both primary and secondary spread mechanisms and their ecological consequences. We created the global database 'DeNIS' on marine debris and NIS to address these challenges in 2023. Currently encompassing 781 reports detailing 763 debris items and 3444 species records, DeNIS boasts contributions from several countries across all continents, reflecting both opportunistic and systematic sampling efforts worldwide. We discuss the latest updates to DeNIS, showcasing its new functionalities and the role of AMD in ecological invasions through new visualizations and data analysis. These enhancements aim to bolster global efforts in managing and mitigating the impacts of AMD and NIS on marine ecosystems, facilitating more effective conservation strategies and policy development.

Session 1 – Risk assessment and management of invasive species

HOW TO NOT STOP AN INVASION: BLACKLISTS AS CONTROL AND PREVENTION MEASURES FOR EXOTIC FRESHWATER TURTLES

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CITES is the international convention that regulates trade to ensure that wild populations are not threatened. Convention parties are required to report importation/exportation of the listed species. Since global trade is one of the main introduction pathways for invasive exotic species, in particular invasive exotic freshwater turtles, CITES database may be used to track invasive species of concern. On the other hand, citizen science platforms, such as GBIF, may provide useful information on species distribution in order to track introductions. In the European Union 1143/2016 regulation, which lists invasive species, includes only one freshwater turtle, *Trachemys scripta* (Ts). We used CITES and GBIF databases to evaluate the influence of 1143/2016 regulation on the imports and introduction of freshwater turtles in Europe. Generalized linear models (GLM) were applied to analyse the import and nature distribution records as a function of continuous temporal and spatial data. Excluding Ts, freshwater turtle CITES imports were related to year, importation country and Ts imports. Likewise, Ts imports were also related to importation country, other turtles importation and year, although only in 1997 significant differences were obtained. Records of wild exotic turtles and of Ts were related to year, importation country and turtle's imports, but not by Ts imports. Overall, we noticed a four-year increase in the imports of other turtles following the 1143/2016 regulation list, but on the other hand Ts imports only peaked in 1997 following the implementation of the 338/97 regulation, which determines as mandatory the registration of Ts imports, decreasing afterwards. Ts records are increasing since 1989, with no influence of any legislation, contrary to other exotic turtles' records which started to increase in 2016. Our results suggest that not only legislative tools are not stopping the spread of already established invasive species but are also allowing trade and introduction of new exotic species.

Session 2 – New tools and approaches for detection and monitoring

DYNAMIC MODELING OF *RUGULOPTERYX OKAMURAE*: IMPLICATIONS FOR ECOLOGICAL MANAGEMENT AND SOCIO-ECONOMIC IMPACTS

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Rugulopteryx okamurae, an invasive brown alga from the north-western Pacific, has established itself as a significant ecological disruptor in some spots of the W Mediterranean Sea and Portuguese coasts since its detection in the Strait of Gibraltar in 2015. This alga's rapid expansion could pose threats not only to marine biodiversity but also to local economies, impacting artisanal fisheries and coastal tourism due to its extensive biomass and habitat domination.

We present a novel dynamic population model developed using STELLA Architect. Our model integrates multiple ecological and economic variables, including size-class-specific growth rates and reproductive strategies, to simulate the spread and management of *R. okamurae* under various scenarios. The model is designed to include the extraction of biological material and its valorization as a way to dampen economic repercussions, should legal procedures be developed allowing such measures to mitigate the species impacts.

Initial results indicate that dynamic models can be designed to reproduce the expansion pace and test the effect of different management approaches, from early strategic interventions to a non-intervention passive policy. Results highlight the alleviation of public funds that are spent on the removal and control of this invasive alien species, when the extraction and valorization of the biomass through high added value compounds is implemented.

This model serves as a crucial tool for understanding the complex dynamics of *R. okamurae* invasions and allows managers to generate different intervention scenarios, including various economic implications (public cost, loss of earnings), that could help preserve marine ecosystems and protect the economic stability of communities.

This contribution belongs to the project "Advanced materials obtained by sustainable extraction methods from invasive alien algae (*Rugulopteryx okamurae*, Dyctyotales) TED2021-130080B-I00, financed by the Ministerio de Ciencia e Innovación of Spain, Plan de Recuperación, Transformación y Resiliencia and NextGenerationEU.

Session 1 – Risk assessment and management of invasive species

OPTIMIZING CONTROL STRATEGIES FOR INVASIVE MONK PARAKEETS (*MYIOPSITTA MONACHUS*): INSIGHTS FROM CAPTURE METHODS AND BAIT PREFERENCES IN MADRID

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Currently, the control of invasive species is subject of much attention due to the impacts that these species cause. Unfortunately, there is a lack of comprehensive reporting on the results and insights gained from control initiatives, which impedes the development of more efficient management strategies. Here, we conducted an evaluation of different methods commonly employed for controlling invasive monk parakeets (*Myiopsitta monachus*). Analysing data from a control campaign done in Madrid (Spain) from May 2021 to April 2023, we aimed to determine the most effective and cost-efficient control methods. Since some of them involved baiting the parakeets so that they land on the ground, we additionally conducted an experiment to determine the best bait used in the control campaign. We found that the method yielding the highest capture rate in spring was the combination of removing both chicks and eggs. Conversely, throughout the rest of the year, the most effective approach was the combination of using a folding net and a net launcher. However, it is worth noting that removing both chicks and eggs incurred higher costs due to the use of a crane, making it preferable only during spring, although this method also demonstrated notable effectiveness outside spring. For the rest of the year, we recommend the use of the folding net and net launcher combination due to being the method with the best cost-efficiency. The bait experiments revealed that bread, either alone or in combination with apple and commercial parrot feed, attracted the highest number of parakeets. Given its affordability, we suggest the exclusive use of bread for attracting parakeets. The results and conclusions from this study will be helpful at planning future control efforts. By enhancing operational efficiency and reducing costs, we hope to contribute to the development of more effective management plans for invasive monk parakeets.

Session 1 – Risk assessment and management of invasive species

BRIDGING HUMAN, ANIMAL, PLANT/ALGAL AND ECOSYSTEM HEALTH IN AQUATIC ENVIRONMENTS THROUGH ONE BIOSECURITY

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Predicting and assessing risks to aquatic biosecurity with ever increasing trade and new trade routes, amid global change drivers like climate change, and ongoing biodiversity loss is both increasingly complex and pressing. One-Biosecurity is a holistic, interdisciplinary biosecurity framework encompassing human, animal, plant and ecosystem health sectors. Current sectorial divisions fail to recognise similarities, problems and processes underpinning biological invasions and their management, ultimately serving to impede biosecurity. A shift away from a siloed approach that often focusses on high-risk taxa and sectorial issues is critical to properly understanding potential linkages, synergies, problems, and common improvements within science and policy. To date, the One Biosecurity concept has focussed on terrestrial invasions and impacts. Here, the concept is broadened to aquatic environments, both marine and freshwater. We conceptually cover how invasive alien species pose significant risks to aquatic ecosystems, identifying impacts on human, animal, plant and ecosystem health; thereby identifying how aquatic biosecurity may benefit from an interdisciplinary, cross-sectorial approach. For example we examine how invasive harmful algal blooms have effects across all sectors, but have limited policy development to minimise risks. Similarly, diseases prevalent in aquaculture such as *Vibrio* spp. can cause human and animal infection, with little guidance across sectors on harm reduction. The evolution of antimicrobial resistance in aquatic pathogens has effects across sectors, and has limited but quickly developing policy. We also note that many of these issues are likely to be affected by drivers of global change, with potentially increasing impacts under climate change on human, animal, plant and ecosystem health. The use of a One Biosecurity approach within aquatic biosecurity would reduce redundancy, minimise gaps, increase cross-sectorial cohesion and interdisciplinarity, improving policy development and scientific focus in global aquatic biosecurity.

Session 3 – Global change and invasions

INVASIVE PLANT MATS IN RIPARIAN ZONES: A THREAT TO SOIL MICROBIAL FUNCTIONAL DIVERSITY AND CARBON AND NITROGEN STOCKS?

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Riparian zones play a fundamental role in linking terrestrial and aquatic ecosystems, providing essential functions such as maintaining environmental stability and filtering pollutants. They also serve as dispersal corridors for propagules and are particularly sensitive to disturbance. Today, these areas are among the ecosystems that are most affected by human activities, making them vulnerable to invasion by invasive alien plants such as *Tradescantia fluminensis*. This South American clonal plant is one of the worst invaders introduced into many parts of the world, with many impacts recorded particularly in New Zealand. This persistent invader forms dense ground carpets, displaces native vegetation, and alters litter decomposition and nutrient cycling. However, how it alters carbon and nitrogen stocks in invaded areas and how this affects the functional diversity of soil microorganisms remains unclear. Therefore, this work aims to assess the impact of *T. fluminensis* on carbon and nitrogen accumulation capacity and its influence on soil microbial functional diversity. To achieve this, we conducted a field study to evaluate the impact of *T. fluminensis* on the plant community and on biotic and abiotic soil factors, using five transects (gradual comparison between invaded and non-invaded plots) at four riparian sites in the northwestern Iberian Peninsula. Our results show that *T. fluminensis* has a detrimental effect on both native vegetation and soil chemistry. We found extensive cover of *T. fluminensis*, forming dense patches that directly compete with native plant species and inhibit their growth. This leads to altered plant-soil feedbacks that modify carbon and nitrogen stocks, soil nutrient levels, promote soil acidification, increase electrical conductivity, and alter the functional profiles of soil microbial communities. Therefore, we suggest that it is imperative to take the necessary measures to control (and if possible eradicate) *T. fluminensis* in order to conserve the biodiversity and functionality of riparian ecosystems.

Session 3 – Global change and invasions

BUILDING AN OPEN ATLAS OF KNOWLEDGE FOR INVASION SCIENCE AND BEYOND: KEY RESULTS OF THE ENKORE PROJECT IN THE HI KNOWLEDGE INITIATIVE

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With the exponential increase in scientific publications, new conceptual and technological tools are needed to help scientists, students, practitioners and policy-makers to navigate and digest current scientific knowledge. Hi Knowledge is an initiative to synthesise and visualise scientific knowledge with a focus on invasion science. The enKORE project within this initiative has ended this spring, and we are presenting key results of this work from the last years, in particular: (1) a new conceptual classification scheme of invasion science, consisting of the major themes, overarching research questions and major hypotheses of the field; (2) a growing corpus of the published literature hosted by Wikidata, already including more than 50 000 publications from more than 10 000 authors; (3) visualization tools through Scholia and Open Knowledge Maps to explore and dive into this corpus in various ways; (4) interactive hypothesis networks and causal networks extending to neighboring fields such as urban ecology; and (5) an observatory hosted by the Open Research Knowledge Graph connected with on-demand analyses to explore publications addressing major invasion hypotheses. We will provide an overview of these results and give an outlook on next steps towards an open atlas of knowledge for invasion science and beyond.

Session 6 – Pathways and dispersal of invasive species

RAILWAYS AS A SOURCE OF ALIEN PLANTS

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Many invasive species are introduced unintentionally as admixtures of various commodities or as hitchhikers. One of the main pathways of introduction and spread is railway transport. We conducted a field survey along the freight railway corridor including 39 localities (Břeclav – Praha – Děčín; Czech Republic), such as railway stations, yards, and railway junctions in 2000–2022. Each locality was divided into three zones reflecting the type of management and land use: (i) tracks and embankments, (ii) wider surroundings of the station, and (iii) surroundings of buildings. The aim was to make a complete list of taxa that occurred in railway stations, yards and their surroundings, assess the representation of aliens, and, by comparing historical and recent records, identify species whose distributions have changed. We obtained 11,139 records belonging to 764 taxa, including 403 (53%) native, 309 (40%) alien, and 85 (11%) red-listed taxa of various threat categories. The tracks and embankments were richer in species, including aliens, and the zones and location of railway stretches affected the species composition; the effect of zones on both species richness and composition was stronger than that of stretches. Compared to the historical records, 109 new aliens were found, while 112 previously recorded aliens were missing. Our results indicate that the tracks, embankments, and the close surroundings of buildings are connected habitats, which is reflected by the species composition of alien assemblages, while the wider surroundings differ and host different aliens. We conclude that the surroundings of the stations and yards are not a stepping stone for the further spread of introduced species along the tracks. One of the reasons why aliens do not spread into wider surroundings is the poor management outside the railway stations, allowing for the presence of many competitively strong, often expansive or invasive.

Session 3 – Global change and invasions

BEFORE THE CRESCENDO: BASELINE ASSESSMENT OF FOULING COMMUNITIES IN RED SEA NEOM, NW SAUDI ARABIA, BEFORE COASTAL DEVELOPMENT AND URBANIZATION

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Maritime traffic and coastal urbanization facilitate the introduction, establishment and proliferation of non-indigenous species (NIS). Our knowledge on how these factors interplay could be improved by monitoring fouling communities in areas subject to new coastal and urban development. Implementing biomonitoring efforts before major interventions occur, will lead to a better understanding of the effects of coastal development on the dynamics of fouling NIS invasions. NEOM in Saudi Arabia (northern Red Sea) is a largely undeveloped region projected for urban, industrial, and commercial development projects, such as The Line, Oxagon (port) and both islands and coastal areas earmarked for tourism and residence. In order to develop a baseline of the fouling community in the region, we deployed PVC settlement panels for 3 months and used eDNA filtration methodologies to catalogue taxonomic biodiversity using combined morphological and molecular approaches. Sampling was conducted in November 2023 and February 2024 at seven sites, with three settlement panels and five water samples retrieved per site and sampling time. Over 40 plate-coverage assessments and 900 voucher samples were collected for morphological and molecular identification, as well as 70 water filtration and 42 panel-scraping samples for eDNA analysis. The results provide the first comprehensive assessment of the fouling community's composition and structure, and NIS presence and abundance in the region, contributing to the construction of a fouling species library. The results show a low NIS richness and abundance, which highlights the relatively good ecological status of NEOM when compared to other anthropized habitats within the Red Sea. An exception within NEOM is the Sharma coastal lagoon, where cryptogenic and NIS calcareous encrusting bryozoans were abundant on plates. The results of this study will improve our capacity to detect and manage marine NIS and provide a crucial baseline for future studies on fouling dynamics and NIS monitoring as the region develops.

Session 5 – Conservation issues and biological invasions

HOW DOES THE IMPACT OF AN INVASIVE SNAKE CASCADES DOWN TO ARTHROPOD COMMUNITIES?

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There is increasing awareness on invasive species leading to cascading effects that reverberate across recipient ecosystems and cause ecological mayhem. However, cascading ecological effects are noticeably understudied for certain species like invasive snakes, which undermines our capacity to anticipate the risk posed by these organisms and counter their ecological impacts. We assessed the indirect impact of *Lampropeltis californiae* on arthropod communities mediated by the depletion of the three endemic and ground-dwelling reptile species. We first analyzed the arthropod component of the diet of the endemic reptiles through metabarcoding techniques to identify the highly, moderately, or less consumed orders. We then estimated ground-dwelling arthropod abundance using pitfall sampling to compare results between a set of invaded and uninvaded sites. To detect the potential effect of *L. californiae* in other arthropod orders, we also surveyed vegetation-dwelling orders with complementary beating and sweeping samplings. Our results confirm the existence of a trophic cascade as all arthropod orders within the highly consumed group were more abundant in invaded sites, whereas no such effect was observed for most moderately or less consumed orders. We bring to light severe ecological consequences of *L. californiae* at the ecosystem level in Gran Canaria, which extend beyond the direct impact upon the endemic reptiles to generate a trophic cascade. From a broader perspective, this study illustrates the capacity of invasive snakes to cause major ecological disturbance in native communities through the depletion of native reptiles.

Session 6 – Pathways and dispersal of invasive species

DIET ADAPTATION AND INVASIVE SUCCESS OF THE COMMON MYNA, SIGNALS OF SELECTION REVEALED BY GENETICS

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The common myna (*Acridotheres tristis*) is one of the most invasive birds in the world. It has been intentionally and accidentally introduced to over a dozen countries. Some of these introductions date back as early as the 1700s, but introductions and range expansion have also been reported in recent decades. The multiple myna invasions provide an opportunity to identify parallel adaptation to help understand why they are successful invaders. One approach to doing so is to examine signatures of selection in their genomes. We use genomic data from 82 individuals from four native and seven invasive populations, representing two independent introduction pathways, to identify regions in their genomes exhibiting parallel signatures of selection. We identified a strongly selected region spanning two copies of the AMY2A gene, part of the alpha-amylase gene family responsible for starch digestion, and a structural variant (SV; variation in the genome > 50 DNA bases). The variation is polymorphic in native populations, but only one variant is present or present in very high proportions in the two invasive pathways, providing evidence for parallel selection on standing variation across the invasive range. The second copy of AMY2A contains a mutation that changes the amino acid, which may change the function of the resulting protein, and the SV contains a transposable element which has been shown to alter expression of neighbouring genes in multiple other species. The AMY2A gene has been associated with human commensalism in house sparrows and genes in this family have been linked to adaptation to high-starch diets in humans and dogs. This study suggests that mynas have repeatedly evolved in their invasive ranges to cope with new diets, and sheds light into the underlying mechanism involved in the common myna invasive successes, with parallel signatures in other human-associated species.

Session 1 – Risk assessment and management of invasive species

OVERLAP TWO INVASIVE ASH PESTS IN EUROPE: WHAT'S IN THE FUTURE HOLD?

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The European ash (*Fraxinus excelsior*) is a vital tree species in Europe, valued for its commercial, ecological, and cultural significance. Currently, it faces severe threats from two invasive pests: the fungus *Hymenoscyphus fraxineus*, which causes ash dieback (ADB), and the emerald ash borer (*Agrilus planipennis;* EAB), a destructive beetle. Introduced from Far East Asia, ADB has devastated ash populations across Europe over the past twenty years. The EAB, notorious for its rapid spread via "hitchhiking" on transport vehicles, is expected to reach Western Europe, including the Nordic countries, soon. EAB has currently extended its reach westward into Eurasia, reaching as far as eastern Ukraine in 2019 and rapidly expanding to central Ukraine by 2023. EAB attacks are typically fatal to ash trees, posing an additional threat to those already affected by ash dieback.

The overlapping ranges of ADB and EAB in Ukraine provide a unique opportunity to study their combined effects on ash populations. The affected area in Ukraine expanded from 13.3 hectares in 2019 to 1212 hectares across three regions by 2023. Both native European ash and introduced green ash are susceptible to EAB. Tested monitoring methods for emerald ash borer spread in Ukraine included trap lures (green and violet), trap girdled trees, and visual surveys. Our research further revealed that EAB adapts to seasonal temperature variations and demonstrates ecological plasticity regarding climatic variables.

We anticipate that *Fraxinus* species, particularly *F. excelsior*, are vulnerable to further mortality and population decline. Additionally, the mycobiome associated with EAB might impact ash mortality and wood integrity. Modelling EAB spread toward the north, identifying and functionally analysing the fungal community associated with EAB, as well as understanding the molecular mechanisms governing EAB and ADB co-occurrence, will offer crucial insights for preserving European ash forests and developing effective conservation policies.

Session 1 –- Risk assessment and management of invasive species

PINK SALMON IN NORWAY – ASSESSMENT OF RISK TO BIODIVERSITY, WILD SALMONIDS AND AQUACULTURE

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Pink salmon (*Oncorhynchus gorbuscha*) is native to the northern Pacific. Following an explosion of pink salmon in the Atlantic in 2017, the Norwegian Scientific Committee for Food and Environment (VKM) was requested to perform a risk assessment of pink salmon for biodiversity, wild salmonids, and aquaculture in Norway. Pink salmon was introduced to the Atlantic in the 1950s by eggs transplanted from Pacific to Atlantic drainages in Barents-White Sea region. These transplantations did not produce self-sustaining populations until 1985 when the source of eggs was changed from Sakhalin to a more northern location (River Ola in Magadan). Transplantations ended around 2000 and pink salmon increased in numbers without any further releases. VKM assessed that the risk for aquatic biodiversity would increase with pink salmon abundance, both by adults dying and decomposing in rivers and by juveniles feeding on invertebrates en route to the ocean. The river mussel *Margaritifera margaritifera* is particularly vulnerable to competitive effects on its hosts (Atlantic salmon Salmo salar and brown trout *S. trutta*). These native salmonids may be delayed on their migration to spawning areas because of aggression from earlier-spawning pink salmon. Interspecific hybridization with native salmonids is unlikely. Marine effects were considered minor but could be major depending on pink abundance. The risk to aquaculture was considered low except disease agents that can use Atlantic salmon and pink salmon as host. Highest risk was assigned to IHN virus and to parasites not yet seen in Norway. VKM was also asked to assess future effects and performed a modelling study that suggested increasing marine temperatures correlated with enhanced pink salmon survival. This is disturbing in a period when temperatures in the northern Atlantic increase. After VKM's report in early 2020, the abundance of pink salmon has increased by 20 times relative to 2017.

Session 6 – Pathways and dispersal of invasive species

EXPERIMENTAL ASSESSMENT OF THE INVASIVE POTENTIAL OF THE TWO INTRASPECIFIC LINEAGES OF THE PONTO-CASPIAN AMPHIPOD - *DIKEROGAMMARUS VILLOSUS* (CRUSTACEA: AMPHIPODA): DOES HYBRIDIZATION INCREASE INVASIVE POTENTIAL?

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Dikerogammarus villosus is one of the most invasive aquatic species of Ponto-Caspian origin in Europe. Two intraspecific lineages originating from geographically and genetically distinct source populations, the Danube and the Dnieper deltas (hereafter: the Western and Eastern lineage, respectively) colonised the majority of waterbodies in Europe. In Poland, the Western Lineage occurs in the River Oder, while the Eastern Lineage inhabits the River Vistula. A high chance of contact through the Bydgoski Canal and upcoming interbreeding between the lineages may result in creating hybrids with higher invasive potential than the parental populations. The broad distribution and high invasiveness of *D. villosus* make it a good model for an assessment of invasive potential on the intraspecific level.

We aimed to test: 1) whether the two lineages vary in invasive potential; and 2) whether interbreeding of the lineages results in hybrids with a higher invasive potential than the parental populations.

The morphological comparisons revealed a high variability of feeding-related traits, suggesting higher omnivory of the invasive populations from both lineages compared to more predatory brackish native populations. We experimentally compared the behaviour of the lineages and F1 generation bred in a mesocosm outdoor culture (including the pure lineages and their hybrids) i.e., food and temperature preference, food and shelter competition, and ability to spread.

The results suggest that the Eastern Lineage is more omnivorous, prefers higher temperatures and successfully competes for space with its Western counterparts. These traits suggest the higher invasive potential of the Eastern Lineage. In the face of climate change and the highly probable further spread of this lineage in Europe, these findings help predict the consequences of future amphipod invasions in the environment. We may expect that future hybrids may achieve a similar or even a higher invasive potential than the parental populations.

Session 3 – Global change and invasions

SCORING THE IMPACT TYPES OF BIOLOGICAL INVASIONS

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The impacts of biological invasions are increasing, highlighting the urgency for better understanding, clearer communication and prioritization of actions. The types of ecological impacts are themselves very numerous and very diverse, and this heterogeneity is impeding research, outreach and management. Despite extensive research and global assessments, a structured and exhaustive typology of these impact types is still missing. In addition, a quantitative component in such a typology of impacts would further improve assessments and the formulation of effective strategies. Here, we propose such a typology of all the ecological impact types. We also propose a relative scoring of these different types, based on current knowledge from biological invasion experts. Our framework accounts for all ecological impacts caused by biological invasions and is structured into 19 types. Through a survey using the Delphi approach, we obtained a score of these 19 types of impacts, differentiating between three ecosystem types and four taxonomic groups. Our study reveals mixed score rankings among experts and underscores the importance of considering ecological context-dependencies. The resulting framework serves as a baseline for prioritizing biological invasions impacts, aiding communication and decision-making and opening venues of research on the quantification of these impacts.

Session 3 – Global change and invasions

INDIGENOUS PEOPLES LANDS HARBOR FEWER INVASIVE SPECIES

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Biological invasions are a growing challenge in a highly interconnected and globalized world, leading to the loss of native biodiversity. Indigenous Peoples' lands (IPL) play a vital role in biodiversity conservation through activities such as land stewardship, and management practices. Similar to protected areas, they are also often remote with fewer connections to international trade networks. The extent to which IPL are threatened by the spread of invasive species is still unknown. Here, we provide a global study detailing the distribution and drivers of alien species on Indigenous Peoples' lands. On average, IPL host 30% (in absolute numbers: 11±3.5) fewer alien species relative to other lands, after controlling for sampling intensities. Alien species numbers remained consistently lower on IPL even after accounting for potentially confounding factors such as differences in accessibility and ecological integrity. The difference may result from land management practices of Indigenous Peoples. In the relatively small number of cases where IPL host disproportionately higher numbers of alien species than other lands, the most likely reason is high alien species propagule pressure arising from proximity to large urban areas. Overall, our results highlight the importance of IPL in protecting nature in the face of increasing biological invasions.

Session 1 – Risk assessment and management of invasive species

AQUATIC INVASIVE ALIEN SPECIES (IAS) GIS-VIEWER

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The Centre for Hydrographic Studies (CEH-CEDEX) has developed a Geographic Information Systems Viewer (VISOR) for The General Directorate for Water of The Ministry for Ecological Transition and the Demographic Challenges (MITECO). This GIS VIEWER includes information on sightings and citations of aquatic Invasive Alien Species (IAS) from Spain. The information comes from both bibliographic sources and sampling campaigns carried out to assess the status of water bodies. In the case of problematic species (such as the zebra mussel), specific samplings are also carried out, which are also included in the GIS VIEWER.

The tool is presented, which currently has 54 species loaded, allowing the download of files with alphanumeric and spatial data containing information about each species. With this viewer, you will be able to find out which invasive species are present or not in each waterbody. Sightings, citations and species profiles can be viewed, allowing queries by different filters.

The GIS- Viewer offers access to updated information on the location of the most frequent and harmful exotic aquatic invasive species, consultation of historical data showing the evolution of these species over time, detailed information on each species through fact sheets. It is possible to filter the information by species, demarcation and water body. The Viewer will be constantly updated, and the information provided allows us to observe the evolution of the presence of these species.

The purpose of this platform is to locate and identify the focal points or populations of exotic aquatic invasive species (IAS) in Peninsular Spain to prevent their establishment and limit their negative impacts on our environment and economy, and provide a useful tool that assists with the management, prevention, control, and mitigation of invasive species.

WEBPAGE: "https://ceh.cedex.es/visoreei/visor/principal/index.html

Session 6 – Pathways and dispersal of invasive species

FROM NOVEL TO NATIVE: PLANT-SOIL FEEDBACKS DEPEND ON FUNCTIONAL TRAITS AND RESIDENCE TIME

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Plant-soil feedbacks (PSF) describe the effect of plants on the biotic and abiotic soil environment, which in turn influences plants subsequently growing on this soil. PSF arise from plants attracting soil mutualists and pathogens, as well as plants altering the soil through root exudates. Because conspecific PSF are often negative (resulting in reduced growth of plant species on their own soil), they contribute to species co-existence. PSF may thus also influence invasion success. While alien species initially often benefit from enemy release, resulting in more positive conspecific PSF, this effect may not last over long timescales. Using a species-for-time approach, this study aims at revealing the potential impact of soil organisms on invaders across species from an early stage of invasion (neophytes) up to species that have resided in Germany for thousands of years (archaeophytes, natives). PSF experiments consist of two phases: 1. conditioning, where soil is conditioned by all plant species of interest; 2. feedback, where plant performance is assessed on conspecific and/or heterospecific and unconditioned soils. We determined conspecific, heterospecific and net-pairwise PSF across 90 interspecific species pairs (including 33 alien and native species grown in 1,017 pots). We found that neophytes (or species with lower residence times) produced more biomass and seeds in conspecific compared to heterospecific conditioned or unconditioned control soils. This effect decreased with increasing residence time. Hence, our results suggest that recently introduced species are initially released from species-specific soil pathogens. However, these soil pathogens then accumulate over time, contributing to a build-up of biotic resistance to invasions. Furthermore, we show how a wide range of plant functional traits explain PSF strength and direction. Our study contributes important insights not only into the short- but also long-term dynamics of plant invasions, which is highly important to understand and manage their threat to biodiversity.

Session 1 – Risk assessment and management of invasive species

MANAGING THE SEED LEGACY OF AN INVASIVE PLANT IN COASTAL DUNES

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Portuguese coastal landscapes changed considerably in the 20th century with the Forest Regime expanding afforested areas to counter coastal sand dune encroachment. By 1947 nearly all dunes were stabilized using a seed mixture of native and alien plants, including *Acacia longifolia*. Native to SE Australia, *A. longifolia* has become a widespread invasive alien plant in Portuguese coastal dunes, promoting significant negative impacts on biodiversity, ecosystems and human activities. *Acacia longifolia* has limited resprouting capacity after being cut, yet it accumulates persistent seed banks that germinate when disturbed. Consequently, the success of the commonly used manual and mechanical control methods is often limited unless long-term follow-ups are assured. To curtail the seed bank and *A. longifolia* ability to spread and reinvade, the Australian bud-galling wasp *Trichilogaster acaciaelongifoliae* was introduced as a biocontrol agent to reduce seed production and new growth. This agent was first released in Portugal in 2015 along the coast and is now widespread. Here, we explore the effects of different control methods on the seed dynamics of *A. longifolia* in coastal dunes for over four years, including seed bank and seed rain. Seed bank density was assessed from 2015 to 2021 at three-year intervals in five sites to evaluate its reduction due to follow-up controls or to *T. Acaciaelongifoliae* biocontrol. Annual seed rain was evaluated at four sites since 2019. Results show that after two follow-up treatments, controlling *A. longifolia* with brush cutters/hogs reduced its seed bank by 74%. Conversely, *T. Acaciaelongifoliae* has largely decreased *A. longifolia* seed production, and the accumulated seed bank appears to have stabilized five years after its establishment. These results are encouraging for the recovery of coastal dunes invaded by *A. longifolia*, emphasizing the pressing need for establishing an integrated strategy and increasing investment in biocontrol to enhance invasive plant management in Europe.

Session 1 – Risk assessment and management of invasive species

EVALUATING ANIMAL WELFARE FOR MULTICRITERIA DECISION ANALYSIS IN THE MANAGEMENT OF THE INVASIVE POND SLIDER TRACHEMYS SCRIPTA

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Invasive alien species (IAS) represent significant threats to ecosystems, economies, and animal and human well-being globally. Managing IAS requires consideration not only of ecological and economic aspects, but also of ethical issues such as animal welfare. Here, we propose a comprehensive framework for the assessment and integration of animal welfare into multicriteria decision analyses (MCDA) in IAS management.
MCDA provides a systematic approach to evaluate the trade-offs among various interests by considering multiple criteria simultaneously. Our framework for the animal welfare assessment encompasses several essential steps. First, management actors, conservationists, and veterinarians are engaged to identify and prioritize criteria for the evaluation of animal well-being and to explore the feasibility and costs of potential actions.
The criteria used align with the "five domains of animal welfare" framework – a scheme for the assessment and promotion of animal welfare across various contexts. The criteria encompass nutritional, environmental, health, and behavioral indicators as well as mental components. Data collection in the field addresses the first four domains, followed by an expert elicitation to evaluate the mental well-being of animals. Experts from different backgrounds rank the impact of different scenarios on animal welfare. Through weighted aggregation of the expert opinions, probabilities are assigned to different levels of impact for each scenario. Thus, the resulting risks of negative impact on the animals of the different scenarios can be incorporated in the MCDA. We illustrate the application of our approach to the case of the invasive pond slider *Trachemys scripta* in Italy and Switzerland. By explicitly considering animal well-being, the proposed framework aims to enhance the ethical integrity and efficacy of IAS management strategies, thereby fostering more suitable and compassionate outcomes for both ecosystems and individual animals.

Session 5 – Conservation issues and biological invasions

A SYNTHESIS ON ALIEN MAMMALS THREATENED IN THEIR NATIVE RANGE

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Global changes drive rising extinction and introduction rates for species worldwide. While many alien species are widespread in their native range, some may be threatened, posing a challenging conundrum for conservation and invasion science. Species threatened in their native range may become invasive when introduced elsewhere, requiring management. Conversely, some alien populations may aid conservation efforts. To make informed decisions, we must enhance our understanding of these species' ecology in both native and alien ranges. We focused on alien threatened mammals, examining their distribution, pathways, threats, and conservation strategies. We also reassessed their IUCN Red List category to evaluate the effect of including alien populations in extinction risk assessments.
Of 242 alien mammals, we identified 41 aliens that are threatened, classified as critically endangered (19%), endangered (27%), or vulnerable (54%). They were primarily introduced for hunting and exchanged within Asia, with introduced ranges concentrated in eastern Australia. They were subject to multiple threats, most notably biological resource use. Lastly, we found that including alien populations in the categorization assessments reduces the extinction risk of 22% of the species.
In this talk, I will show that many alien mammals that are threatened in their native range, and discuss the conservation value and pitfalls of alien populations of threatened mammals. Some alien populations may serve as "safety populations", safeguarding species in unforeseen events like fires or demographic declines in native populations, ensuring the preservation of a viable species population. However, conservation managers and extinction risk assessors shall carefully consider this use, to avoid negative impacts on native biodiversity.

Session 1 – Risk assessment and management of invasive species

A REVIEW OF THE EFFECTIVENESS OF DIFFERENT MANAGEMENT METHODS FOR IAPS IN WOODLANDS AND FORESTS GLOBALLY

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Invasive alien plants (IAPs) have been identified as one of the top five drivers of biodiversity decline. The ability of IAPs to tolerate a wide range of environmental conditions has enabled and facilitated their expansion into multiple habitat types different to those in their native range. For example, certain riparian IAPs have been reported colonising previously uninvaded woodlands and forests. Moreover, the spread of IAPs into these habitats has accelerated over the last 20 years, with further future invasions predicted with global climate change.

Research showing the negative impact of IAPs on woodlands and forests has called for increased management efforts to reduce economic and environmental impacts of invasions.

However, the effectiveness of different IAP management techniques has not yet been assessed in woodlands and forests globally. We conducted a systematic review to assess the effectiveness of the various management methods used on IAPs in woodlands and forests over the last 50 years. After duplicate removal, we reviewed 8,266 peer reviewed and grey literature articles and we found bias in the species and countries studied. We also found that there is a lack of knowledge on the cost to implement management methods and if there is any impact of the time of year the management is implemented.

Given the cost and time taken to manage IAPs, the lack of method evaluation can impact the efficacy of future IAP management. This review summarises success and failures given case study context, to inform future management of IAPs in woodlands and forests, highlighting critically understudied habitats, species and countries.

Session 6 – Pathways and dispersal of invasive species

ESTIMATING INVASION DYNAMICS OF *CACTOBLASTIS CACTORUM* IN NORTH AMERICA

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Cactoblastis cactorum (Berg) (Pyralidae: Phycitinae), better known as the "nopal moth" or "prickly pear moth" is a native species of South America that feeds on several species of the genus Opuntia. It was introduced to Australia in 1925 as a biological control agent to address the invasion of Opuntia species from America. Subsequently, *C. cactorum* was released with the same purpose to Hawaii, India, South Africa, and some Caribbean Islands. During its expansion in the Caribbean, it caused a significant reduction of the native populations of Opuntia species, which are one of the most important genera in the cacti family in America. Here we assess the potential distribution of *C. cactorum* worldwide and its invasion dynamics in North America. To this end, we first modeled its potential distribution using correlative niche models calibrated with bioclimatic information, global soil-related bioclimatic variables and soil layers. Then, we estimated the invasion dynamics of the species from the United States to Mexico and from the Yucatan Peninsula to other parts of Mexico. To achieve this, we used a process-based model in which the distribution depends on the dispersal capabilities of the species and its environmental suitability. Simulations started from two initial points: 1) The nearest population to the Mexican border with the United States of America in Texas, 2) The closest continental area to Isla Mujeres, Quintana Roo.

The dynamic model shows that the success of the invasion in Mexico is more likely to occur from the northeastern frontier of Mexico with the United States. These suggest that the region most susceptible to invasion extends from the coast of the United States (Georgia, Alabama, Louisiana, and Texas) to Mexico (Nuevo Leon, Tamaulipas, and Veracruz), and only a small region between the municipality Isla Mujeres and Soledad, Quintana Roo has high risk of invasion.

Session 4 – Socioeconomic impacts of invasions

LONG-TERM IMPACTS OF THE EU TRADE BAN IN THE WILDLIFE TRADE NETWORK

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The global wildlife pet trade significantly contributes to the widespread introduction of invasive alien species (IAS). However, the exact mechanisms through which wildlife trade influences invasion risks extend beyond the mere transportation of individuals to new areas and remain largely unknown. In this study, our aim is to investigate the impact of the European Union (EU) ban established in 2005, prompted by concerns related to avian flu, on the global wildlife network involving wild-caught avian species.
To achieve this, we utilize data from the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Our analysis compares how the EU ban affected the importation of wild-caught birds both before (up to 2005) and after the ban (up to 2023), as well as how it is currently being influenced by the war in eastern Europe since 2022.
Drawing on previous studies conducted by our team, we anticipate that significant changes may be observed across different geographies.

Session 3 – Global change and invasions

ARE THE DAYS OF NATIVE SPECIES NUMBERED? – EFFECTS OF GLOBAL WARMING ON THE FUNCTIONAL RESPONSE OF NATIVE EUROPEAN BULLHEAD AND INVASIVE RACER GOBY

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We are currently witnessing climate change at a rate unprecedented in human history. This phenomenon affects ecosystem functioning at all levels, from single species to whole communities. However, predicting its consequences for interspecific interactions is challenging, especially for species of different origin and evolutionary history. Here, we use the functional response (FR) approach to analyse the effect of elevated temperature on the feeding efficiency of the native European bullhead and the invasive Ponto-Caspian racer goby, species with similar morphology and habitat preferences, which often compete for limited environmental resources in ecosystems invaded by gobies. We tested the response of individual fish at two temperatures (15°C and 23°C), six prey densities and two prey types (mobile and immobile). Using the FR approach, we showed that gobies always consumed significantly more than bullheads in all treatments. Gobies advantage was stronger at the higher temperature. Moreover, active prey were always consumed significantly more often than inactive prey, and this divergence was greatest for bullheads at the higher temperature. Consumption generally increased with body mass. Warming accelerated the increase in consumption rate of the racer goby per unit mass, but completely reduced the effect of body mass on consumption rate in bullhead. As a result, food consumption by bullhead at the higher temperature was reduced to a minimum level, insufficient to sustain their life functions. According to our prediction, the monthly average temperature is projected to reach 23°C in June, July, and August between 2055 and 2080. As a result, we predict that the European bullhead will be redistributed from its current habitats and gradually replaced by invasive gobies.
This research was supported by National Science Centre, Poland (Grant No. 2020/39/D/NZ8/01226)

Session 2 – New tools and approaches for detection and monitoring

PARASITIC MONOGENEAN FLATWORMS AS TAGS FOR INVASIVE AQUATIC VERTEBRATES IN AFRICA, USING MITOCHONDRIAL MARKERS AND HISTORICAL COLLECTIONS

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Reasons why introduced alien species are major risks to biodiversity include parasite co-introduction and lateral transfer to local hosts, but this parasitological impact is understudied. The origins and identities of introduced organisms are often unknown, including those of their parasite fauna. Recent species monitoring only provides partial answers for want of baseline data: especially in the Global South and in sub-Saharan Africa in particular, where native parasite biodiversity is poorly known.

We studied introduced vertebrates (cichlids, sardines, frogs) in Central and Southern African inland waters, and parasitic flatworms (monogeneans) infecting them. Given their obligate one-host lifestyle, these parasites are thought to be more easily co-introduced with their hosts, and to be used as "tags" for the origin and introduction pathway of host populations.

Parasites were isolated from hosts sampled from historical collections and in recent fieldwork. Monogenean parasites were morphologically identified to species level, and characterised using nuclear and mitochondrial markers.

Using historical fish collections to reconstruct pre-introduction baselines for cichlid parasite communities, we distinguished between native and co-introduced parasite species, and detected parasite transmission to native cichlids. Monogeneans helped identify origins and introduction pathways of invasive sardines. For the notoriously invasive Nile tilapia and African clawed frog, these parasites provided a higher resolution than host genetics.

This a proof-of-concept of biodiversity infrastructure and parasites as information sources for invasion biology. Nevertheless, a review of the state-of-the-art of parasitological research on Nile tilapia, an invasive fish of global economic and ecological importance, shows that work on its parasites mostly overlooks their indicator potential. We recommend more scientific consideration to the parasites of invasive species, using a more integrative approach than is currently often taken.

Session 1 – Risk assessment and management of invasive species

TIME MATTERS - THE STORY OF SPECIES-RICH, SEMI-NATURAL GRASSLAND RESTORATION IN A SITE DOMINATED BY INVASIVE SOLIDAGO SPECIES.

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Successful restoration of habitats invaded by alien plant species is a long-term process that should include three stages: invasive species removal, habitat restoration, and further management. An integral element of the restoration process is continuous monitoring to assess the effects of interventions.
We present the results of an 8 years experiment on the restoration of a semi-natural grassland invaded by *Solidago* species (*S. gigantea* and *S. canadensis*). Three kinds of removal treatments (herbicide spraying, rototilling, turf stripping) and two seed addition methods (direct sowing of a fast-growing grass species mixture, and spreading of fresh hay collected from a semi-natural meadow) were examined. The treatments were applied once, during the experiment establishment. In the following years the experimental plots were mowed twice a year, and the vegetation composition was assessed every year.
Our results showed a positive effect of grassland restoration on species richness and composition, manifested by a decrease in Solidago cover and an increase in cover and richness of target graminoids and forbs. The seed source have a long lasting effect on the vegetation composition, whereas the effect of the removal treatments ceased to differ significantly after the first few years. Applying fresh hay as a seed source increased the cover of grassland species such as *Arrhenatherum elatius* and *Poa pratensis*. For commercial seed mixture, we observed a high cover of *Lolium perenne* and *Schedonorus pratensis* (introduced with seed mixture) at the beginning and a slow decrease along the experiment course. The most striking effect was the fresh hay with herbicide application. Nonetheless, with years the non chemical methods, including no treatment, gives comparable to herbicide effectiveness of restoration. In conclusion, it should be emphasised that short-term effects differ considerably from long-term outputs, especially highlighting the importance of seed source, as well as effectiveness of environmentally friendly methods such as regular mowing to control the invader.

Session 1 – Risk assessment and management of invasive species

CAN ENDANGERED NATIVE FISH BE USED TO CONTROL INVASIVE AMPHIBIANS?

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In Portugal, the African clawed frog, *Xenopus laevis*, successfully invaded two small stream basins, dominating the ecosystem at the expense of native species of fish and amphibians. Currently, there is a protocol to control and eradicate this species in Portugal, and the actions have been successful. However, the capture of the last cryptic individuals has been difficult. As such, complementary control methods must be implemented to prevent reproduction and recolonization by the remaining adults of the species. A promising new technique is the use of native generalist predators as biocontrol agents, which has the double advantage of not only reduce the population of *X. laevis*, but also foster the predator population recovery in previously degraded areas.
To determine which species would be more suitable as biocontrol agent, we tested the functional responses and satiation curves of two endemic freshwater fish (a cobitid, *Cobitis paludica* and a cyprinid, *Iberochondrostoma lusitanicum*), both potential predators of *X. laevis* eggs.
Both species were found to display a type II functional response (meaning that predation rates increase with prey abundance until an asymptote is reached) which, in natural conditions could lead to an imbalance of the prey population due to over predation. This result suggests both species are suitable candidates to be used as a control agent. However, our 8-day satiation experiment also showed that *I. lusitanicum* consumes on average six times more eggs (31 eggs/day) than *C. paludica* (5 eggs/day). As such, we suggest that it would be the best candidate for a biocontrol agent to be used in Portugal, an approach that has never been used to control invasive amphibians.

Session 2 – New tools and approaches for detection and monitoring

INVASION OF A SMALL PERI-URBAN STREAM BY THE EXOTIC NEW ZEALAND MUD SNAIL

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Invasion by non-native species is one of the greatest threats to freshwater biodiversity and ecosystem functioning. Disturbed ecosystems are more prone to invasion because chronic stress tends to erode ecological resilience, decreasing resistance to invasion over the long term. Among invaders, the New Zealand mud snail, *Potamopyrgus antipodarum*, has spread all over the world except Antarctica but with only nine records in Portugal. In 2004, the New Zealand mud snail was detected in a stream subjected to multiple stressors at relatively low abundances.
From 2004 to 2014, benthic samples were collected nine times in five sampling campaigns by four different students using a Surber sampler. The average density of the sites was used to calculate the cumulative density in the stream, and simple linear regression was used to test if time significantly predicted those values. The cumulative density in the stream increased steadily during the study period, from a global average across sites of 328 individuals/m^2 in January 2004, to 2100 in May 2009, and 3778 in April 2014. In the regression model, the overall population strongly adhered to a linear fit with an estimated mean initial size of N0 = 372 individuals/m^2 ± 150 (95% CL) and a monthly rate of increase of 28 individuals/m^2 ± 1.8 (95% CL). With these values, it would take 60 years from 2004 to achieve the carrying capacity predicted elsewhere for European streams. Data collected by higher education students may fill data gaps and complement information gathered by national authorities, namely regarding invasive species.

Session 2 – New tools and approaches for detection and monitoring

EARLY DETECTION TOOLS FOR INVASIVE INSECT SPECIES ON MEDITERRANEAN ISLANDS: THE CASE OF INVASAPP

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Global change poses significant threats to contemporary society, particularly impacting island territories like the Balearic Islands. Among these threats, the introduction of invasive species stands out as a leading cause of biodiversity decline, substantial economic costs, and potential risks to human health.
This study aims to introduce the inaugural early detection network for invasive insect species, prioritized by the European Union, within the Mediterranean archipelago, specifically the Balearic Islands. This initiative is founded on two primary strategies: (1) establishing a trapping network in regions of plant material entry and distribution, and (2) developing a mobile application enabling citizens to report sightings. The ultimate goal is to formulate a tailored management plan for Early Detection and Rapid Response (EDRR) to control and eradicate these invasive species. Notably, the insular nature of the Balearic Islands presents a unique advantage in this endeavor.
The initial findings revealed the presence of the European hornet (*Vespa crabro*), previously absent from the Balearic Islands. In response, the Ministry has considered classifying it as an invasive species, applying the precautionary principle, and implementing a protocol for nest detection.

Session 1 – Risk assessment and management of invasive species

DOES THE IMPACT OF INVASIVE TREES ON TEMPERATE FORESTS SCALE ALONG THEIR ABUNDANCE GRADIENT?

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Most studies assessing the effects of invasive non-native tree species in forests focus on comparing invaded and uninvaded sites. However, the effects of invasive species depend on their abundance. We aimed to assess the impact of two tree species invasive in Central Europe: *Prunus serotina* Ehrh. And *Robinia pseudoacacia* L. on biodiversity and ecosystem functioning along their abundance gradient. For that we established 160 study plots (500 m^2) in western Poland. Within these plots we measured all trees and shrubs and using published allometric models, calculated their aboveground biomass. With these measures it was possible to assess the extent to which the invasive species studied affect the total biomass of the stand and whether they replace or complement native species. We obtained gradients of aboveground biomass from 0.18 to 47.11 Mg ha^{-1} for *P. serotina* (with an average of 7.01 ± 7.97 Mg ha^{-1}) and from 0.22 to 278.23 Mg ha^{-1} for *R. pseudoacacia* (with an average of 35.84 ± 56.19 Mg ha^{-1}) and control (uninvaded plots). We also assessed natural regeneration to assess its response to variation in the abundance of invasive trees, as well as understory vegetation. In a subset of plots (n=46), we installed sensors that record temperature (15, 2, and -8 cm above ground level). Our results show that different metrics of invasive tree abundance reveal different dimensions of impacts and the importance of their selection for particular aims. Abundance gradients reflect various stages of invasion, related to spatiotemporal dynamics of studied species. Using control plots is crucial for determining thresholds of impacts in stands adjacent to those dominated by invasive species, where studied species are encroaching. These results broaden our understanding of the consequences of invasive trees spread in temperate forests.
Funding: National Science Centre, Poland 2019/35/B/NZ8/01381 "Impact of invasive tree species on ecosystem services: plants biodiversity, carbon and nitrogen cycling and climate regulation".

Session 5 – Conservation issues and biological invasions

REMOVING INVASIVE KELP SPECIES IN RECREATIONAL MARINAS TO PRESERVE A NATIVE ONE

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The Asian kelp *Undaria pinnatifida* (Harvey) Suringar is one of the two seaweeds listed among the world's 100 most invasive species. Since the 1970s, this species has successfully invaded numerous areas of the world. Currently, in the Iberian Peninsula, *U. pinnatifida* can be found on the Galician coasts (north-west Spain) and in different sites of the Cantabrian Sea (north Spain) both in natural rocky shores and recreational marinas. In the north Portuguese coast, this species is present only in recreational marinas, where it reaches high densities. However, it is absent in natural rocky shores and recreational marinas located in estuarine areas. In some marinas the arrival of *U. pinnatifida* excluded the native *Saccharina latissima* (Linnaeus) C.E.Lane, C.Mayes, Druehl & G.W.Saunders, 2006 that used to growth in marinas

In June 2023, a manipulative experiment was done in the marina of Viana do Castelo in which individuals of *U. pinnatifida* were eliminated. After 3 months (September), a new Undaria removal was done. Results showed that within three months, Undaria was able to colonize areas of the marina that had previously been eradicated. However, individuals showed significantly lower lengths, the total biomass was also three times less than that in June and few individuals of *S. latissima* were found again. During sampling in December and March 2024 no more individuals of *U. pinnatifida* were found, but few individuals of *S. latissima* were able to colonise the marina.

Acknowledgements: This research was developed under the Project Marina-Forests (2022.06806.PTDC) funded by Foundation for Science and Technology (FCT). PVeiga (CEECIND/03893/2018) was hired through the 'Regulamento do Emprego Científico e Tecnológico—RJEC' and J. Fernández-Gutiérrez (2023.04100.BD) by a PhD scholarship from the FCT.

Session 5 – Conservation issues and biological invasions

COMPETITIVE EXCLUSION OF NATIVE SPECIES BY INVASIVE CONSPECIFIC WITHIN CARASSIUS GENUS

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Successful invasive non-native fish species can cause enormous damage to native biodiversity. On the European mainland, the introduction of the gibel carp (*Carassius gibelio*) has led to a decline in populations of the formerly widespread native crucian carp (*Carassius carassius*). Due to the effects of the invasion of the gibel carp, the crucian carp has been moved from the status of least concern to the status of critically endangered in Czechia in recent decades, and its population has also declined in other countries where the gibel carp has invaded. This contribution summarises the findings on the competitive displacement of native species by invasive species from both experimental approaches and historical trends. The recent findings demonstrated that the gibel carp utilises food sources much more efficiently than its native counterpart. The gibel carp are not only more aggressive and utilise shared resources faster, but also use plant material that is not available to the crucian carp as an effective food source. Finally, this contribution provides circumstantial evidence that the gibel carp is behind the transition from the relative abundance of large crucian carp to near extirpation in Czechia, while large gibel carp have taken over the reports of record angling catches in the genus *Carassius*. Taken together, the current findings strongly suggest that the crucian carp is being locally extirpated by the gibel carp. Due to the uneven competition between *Carassius* species, programmes to repopulate selected waters with crucian carp are probably necessary.

Session 3 – Global change and invasions

LINKING THE THERMAL RESPONSE OF SEEDLINGS OF HERBACEOUS SPECIES TO NATURALISATION SUCCESS

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Temperature is a major factor influencing seed germination timing and early seedling development, thus the post-germination thermal response of seedlings is key to successful establishment and persistence of a species in a community. Information on how seedlings' thermal responses are related to the successful naturalisation of alien species outside their native distribution range, however, is scarce. To address this issue, we examined the effects of seven temperature regimes on the rates of leaf appearance (I to V pair of leaves) in 124 herbaceous species that are either native or alien to the Czech Republic. Specifically, we evaluated, in a phylogenetic framework, whether the thermal response of native species (64 species) differs from that of alien species and how it is related to a range of species traits and the characteristics of their main habitats. We then evaluated whether the extent of naturalisation (number of regions) of the study species is related to their seedlings' thermal response. Preliminary findings suggest that seedling development is significantly slower in native than naturalised alien species at temperatures above 18°C. The extent of naturalisation is significantly related to the thermal response of seedlings at 26°C but not at other temperature regimes. These findings suggest that alien species might benefit from rapid leaf appearance relative to that of native species. However, the overall extent of naturalisation is in general not strongly affected by the thermal response of a species' seedlings at sub- or supraoptimal temperatures regimes. Overall, this study adds a further piece to our understanding of the importance of early stages of plant development in facilitating the establishment of alien plants in their introduced ranges. Ultimately, this information is key to advance our ability to predict future species distribution trajectories based on the response of seedlings to a warming climate.

Session 1 – Risk assessment and management of invasive species

KNOWING THE ENEMY: IMPACT OF *SPANOLEPIS SELLOANAE* (DIPTERA: CECIDOMYIIDAE) IN SEED GERMINATION OF THE INVASIVE PLANT *CORTADERIA SELLOANA* (POACEAE)

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Biological control can be a selective, inexpensive and efficient control method for invasive plant species. Most control methods of the invasive Pampas grass, *Cortaderia selloana* (Schult. & Schult.f.) Asch. & Graebn, are either mechanical or chemical, with a low efficiency. In this work we studied the impact of *Spanolepis selloanae* Gagné (Diptera: Cecidomyiidae), a gall midge and potential biological control agent for *C. selloana*. We have studied the impact of *S. selloanae* on the production and viability of *C. selloana* seeds in plants from an experimental site in NW Spain (Arteixo, A Coruña). An average of 40% florets of female plants showed signs of infection, and 27% contained seeds. Most hermaphrodite plants did not produce seeds and showed no signs of infection except for one individual. Seeds produced by females were classified based on the alterations caused by *S. selloanae* larvae into normal (no alterations), deformed (altered morphology of the seed), thinned (seed mass reduced) or incomplete (missing seed fragments). Germination experiments showed that seeds classified as deformed lost 16.4% of viability, thinned seeds lost 35.2% and incomplete lost 54.2% when compared to normal seeds. These data show a significant reduction of viability of *C. selloana* seeds due to the presence of *S. selloanae*, which supports its potential use as a biological control agent.

Session 5 – Conservation issues and biological invasions

ASSESSING THE IMPACT OF INVASIVE BLEAK ON IBERIAN BARBEL HABITAT UTILIZATION IN FLUCTUATING FLOW ENVIRONMENTS

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Flow regulation and biological invasions present substantial challenges to freshwater biodiversity, notably impacting native fish populations in rivers worldwide. Due to deliberate introductions and natural proliferation, the bleak (*Alburnus alburnus*) now inhabits all major river systems across the Iberian Peninsula. The presence of this species threatens native fish biodiversity due to habitat competition and hybridization. Yet, the extent of interaction between this species and native fish, particularly concerning habitat selection amid rapid flow fluctuations associated with hydropower production, remains uncertain. This study sought to examine how the rapid flow changes and the presence of bleak affect the use of artificial habitat by a native species, the Iberian barbel (*Luciobarbus bocagei*). The study took place in an indoor flume, where fish were exposed to both base and peak-flow conditions. We monitored the frequency of artificial habitat use by fish and measured glucose and lactate levels to assess any stress effects caused by the presence of bleak on barbel. Results indicated that bleak hindered the barbel's ability to utilize available habitat, especially during peak-flows when barbels were without bleak. Furthermore, in the presence of bleak, barbels exhibited significantly higher levels of glucose and lactate, particularly during peak-flow events compared to base flow conditions. This study offers novel insights into the dynamics between invasive and native species, highlighting how invasive species compete for habitat in environments with highly fluctuating flows. These findings underscore the significance of managing biological invasions to mitigate the loss of freshwater biodiversity.

Session 2 – New tools and approaches for detection and monitoring

THE ROLE OF NON-NATIVE SPECIES ON RIVER BIOASSESSMENT

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The introduction and spread of non-native species/taxa (NN) are a growing concern in rivers globally. However, there is still insufficient evidence of whether existing bioassessment tools are sensitive to the effect of NN on riverine ecosystems. To fill that gap, we reviewed indices used in 17 countries from 6 continents and analyzed the role of NN on existing indices from 5 countries/4 continents (8 databases), focusing on the most common bioindicators used in the assessment of rivers (invertebrates, fish, macrophytes, and algae). Fish had the highest number of NN reported, followed by macrophytes, invertebrates, and algae. The abundances of NN were associated with the general degradation of rivers (Canonical Correspondence Analyses) and NN species richness and abundance were negatively associated with native communities and indices across all biological groups analyzed. Yet, index scores were not consistently lower when NN were recorded and sometimes increased. When all NN were accounted for by the indices, scores were strongly negatively correlated (Spearman $r=0.7$, $p<0.001$) with NN richness and abundance, but when NN were only partially considered, the correlations varied from strong to insignificant. Finally, indices that did not

account for NN occasionally showed weak correlations with NN. Therefore, we recommend the following: i) Include specific NN metrics in indices for all biological quality elements. ii) Better determine NN species for algae and invertebrates. iii) Eliminate sites with NN occurrences from reference databases whenever possible. iv) Do not combine both natives and NN in richness and abundance metric calculations. v) Where possible, identify taxa to species.

Session 6 – Pathways and dispersal of invasive species

DISTRIBUTION AND HOST RANGE OF *NEOERGASILUS JAPONICUS* (ERGASILIDAE), A HIGHLY INVASIVE PARASITIC COPEPOD

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Co-introduction of parasites with their hosts is quite a common phenomenon, but only a few have been able to spread to a wide range of local hosts and become invasive. The parasitic copepod *Neoergasilus japonicus* (Ergasilidae), native to East Asia, has rapidly spread worldwide in the past half-century and represents an example of a successful parasitic invader. The species has been introduced to western Asia, Europe, America and Africa, with aquaculture and fish introductions expected as the primary vectors of its dispersal.

We compiled available published data to assess global geographic and host distribution of the parasites. In addition, ewe conducted field and experimental studies to evaluate the distribution and host preference of *N. japonicus* at the local scale, specifically in the Czech Republic in central Europe.

Neoergasilus japonicus exhibited considerably low host specificity, parasitizing a diverse range of freshwater fishes. Our study updates the global fish species list to 123, spanning 25 families across 13 orders, with Cypriniformes identified as the most susceptible host species. However, under experimental conditions, *N. japonicus* avoided the native cyprinid *Pseudorasbora parva*, suggesting its resistance to the native parasite. Regional field investigations in the Czech Republic revealed a surprisingly high number of affected localities, indicating a potentially wider distribution than currently recognized. Piscivorous and demersal fish were less infected compared to planktonivorous, benthivorous, pelagic, and benthopelagic species, reflecting the ecology of both the parasite and its hosts. The ability (although very small) to reattach to another host, which is very rare in parasitic copepods, could potentially increase the parasite's chances of survival. Recognizing the ecological impacts and potential consequences associated with the introduction of non-native parasites emphasizes the need for continuous monitoring and research globally.

Acknowledgement: this study was supported b CSF project No. 23-07185S.

Session 2 – New tools and approaches for detection and monitoring

DATA DRIVEN HORIZON SCANNING: LEVERAGING 10 YEARS OF MONITORING PROGRAMS AND GENETIC DATA TO IDENTIFY POTENTIAL INVADERS TO NORWAY

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Invasive alien species (IAS) threaten biodiversity globally, significantly impact ecosystem function, and inflict economic losses. Successful, cost-effective management and control of IAS heavily depends on early detection and rapid response measures to interrupt the invasion process. Horizon scanning is a key element in early detection and is a method for prioritizing IAS that identifies potential future IAS and their risks to local ecosystems prior to introduction and establishment occurring. Conventional horizon scanning relies on consensus-based expert selection of a suite of taxa followed by systematic evaluation against predefined risk criteria. Taxon selection is the critical first step in horizon scanning, and frequently involves compiling lists from national and global databases of taxa that have been reported as invasive in other areas and known introductions to the focal area that have not yet successfully established. Here we present the results of 10 years of systematic monitoring of plant and insect species introductions to Norway via the horticultural plants import introduction pathway and demonstrate how this data is leveraged in horizon scanning to identify a suite of alien species being introduced to Norway from source pools across the globe that would have been otherwise unlikely to be risk assessed. A subset of the taxa introduced via this pathway are in fact native to Norway and represent risk for cryptic invasions of foreign genotypes or ecotypes. The use of high-throughput next generation sequencing methods to identify insect taxa, when coupled with similar genetic data from national biodiversity monitoring programs, allowed us to conduct horizon scanning to identify potential risk for cryptic invasions by foreign genotypes. This data-driven approach to taxon selection for horizon scanning improves our abilities to manage and assess relevant taxa before they potentially establish in new locations and habitats.

Session 3 – Global change and invasions

WHEN *RUGULOPTERYX OKAMURAE* ARRIVES: SPATIO-TEMPORAL PATTERNS INFLUENCING COMMUNITY STRUCTURE IN INVADED HABITATS

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The invasive macroalgae *Rugulopteryx okamurae* has significantly monopolized extensive benthic habitats across the western Mediterranean. However, its colonization dynamics remain unknown to date. Understanding the patterns involved in its successful establishment could help identify colonization opportunities for resident communities. In this study, three stations along an environmental perturbation and hydrological gradient in the northern Strait of Gibraltar were selected for an ecological succession experiment. Biogenic horizontal plates (25x25x1.5cm) (n=10) were randomly deployed in October 2021 to identify (i) the role of abiotic factors and species interactions on the sessile community development and (ii) the successional stage at which *R. okamurae* arrives. To assess possible effects of season on initial colonization, three new plates were deployed in January and July 2022. Percent cover of the sessile community on both the plates and neighboring rocky habitats was monitored monthly. Results showed recruitment rates of main taxa fluctuating in space and time. At the innermost station, resident colonizers exhibited greater temporal consistency regardless of the installation timing and were characterized by filter-feeding macroinvertebrates. This contrasted with the prevalence of generalist erect macroalgae in the intermediate and external stations, where the community exhibited greater variability over the course of succession. Throughout the year, *R. okamurae* dominated the surrounding habitats across the entire gradient (>80% coverage). However, its initial establishment on plates exhibited spatial and seasonal fluctuations, with delayed colonization observed at the innermost station and those installed during autumn and winter. Findings suggest that the endpoint communities in habitats highly invaded by *R. okamurae* are influenced by the timing and environmental exposure, which in turn, affects propagule supply and settlement patterns of structuring species.

Session 5 – Conservation issues and biological invasions

THE IMPACT OF INVASIVE ALIEN PLANTS ON RIPARIAN VEGETATION IN KRUGER NATIONAL PARK

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Invasions by alien plants in protected areas are widely assumed to decrease native diversity and impact species composition, replacing locally specific species with common, widespread natives and other aliens. However, data supporting this assumption are still limited and non-systematic. We focused on three invasive plants, widespread in the riparian habitats of the Kruger National Park, South Africa: *Datura innoxia*, *Parthenium hysterophorus*, and *Xanthium strumarium,* all annuals from North America. We estimated their community-level impacts by comparing heavily invaded vegetation with high dominance of the target species to the adjacent uninvaded vegetation. Of the three invasive species studied, only *Parthenium hysterophorus* significantly suppressed native species richness. *Datura innoxia* and *Xanthium strumarium* did not decrease the number of species; still, it reduced the species diversity measured by the Shannon index, but only when both native and alien species in the invaded community were considered. All three target invaders had a significant effect on the relative abundances of individual native species. Interestingly, *Parthernium hysterophorus* was not detected to have a qualitative compositional effect expressed by the presence/absence of individual native species, even though it reduces native species richness. As expected, most native species prefer to grow in the adjacent, uninvaded vegetation. However, some native species, such as *Abutilon ramosum*, *Grewia villosa*, *Bothriochloa radicans*, or *Setaria sagittifolia*, were more frequent in the invaded vegetation. This suggests that the effect of invasive aliens may be even facilitative, e.g. by stabilizing the riverbeds and creating less intensively disturbed habitats. Of the three target aliens, *Parthenium hysterophorus* represents the most severe threat to the vegetation of KNP, mainly due to (i) its consistent negative effect on native species richness and (ii) its tendency to spread from the riverbeds and expand into the surrounding vegetation.

Session 4 – Socioeconomic impacts of invasions

EFFECTS OF HISTORICAL LAND COVER, ENVIRONMENTAL AND ANTHROPOGENIC FACTORS ON INVASIONS BY ALIEN PLANTS IN THE CZECH REPUBLIC

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We investigated factors that determine the level of plant invasions in the Czech Republic in different stages of the invasion process (non-invasive naturalized vs invasive) and for species with different residence time status (archaeophytes vs neophytes), using unique data on the historical development of the land cover and its current state. We hypothesized that neophytes and invasive species would be more strongly influenced by higher propagule pressure and frequent disturbances, while archaeophytes by land cover continuity.
We used species occurrence records in 2,370 grid cells (~ 6.0 x 5.5 km) covering the area of the Czech Republic. Environmental and anthropogenic variables and historical land cover data were used as explanatory variables of invasion levels, defined as the proportion of alien species recorded in each grid cell. Historical land cover data were extracted from digitized historical topographic maps for five periods since the 1840s. These data allowed us to quantify landscape dynamics within the last ~180 years.
The proportions of archaeophytes, naturalized, and invasive species in the grid cells were best explained by environmental factors, especially the growing degree days, followed by historical variables. In particular, forest continuity (i.e., the proportion of areas that remained forested since the 1840s) showed a strong and statistically significant negative relationship with the proportion of these species groups. In contrast, current anthropogenic factors, especially the size of built-up areas, had the strongest effect on the proportion of neophytes. In this case, human impact over-rode the effects of historical factors and environmental variables. In conclusion, the factors influencing the level of invasion in the Czech Republic vary depending on the stage of alien species in the invasion process, their residence time, and the historical context.

Session 6 - Pathways and dispersal of invasive species

PUBLIC INFORMATION USE IN INVADED AQUATIC COMMUNITIES – ARE INVASIVE DEMERSAL FISH SPECIES MORE EFFECTIVE THAN NATIVES?

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Organisms determine environmental quality using their senses and personal experience (personal information), but can also use by-products of other individuals' activities, i.e. public information. The ability to use public information originating from both con- and heterospecifics gives an advantage over individuals relying only on personal information or conspecific cues. Public information plays an important role in invasion ecology as an effective way to collect information about the novel environment during the invasion process. Moreover, at the beginning of the process, invasive conspecifics are rare and unfamiliar with the environment, which makes the ability to use information from heterospecifics beneficial. Thus, any differences in this aspect between alien and native species may determine the success and further spread of the former. Here we used two pairs of sympatric, invasive and native demersal fish species (the racer goby *Babka gymnotrachelus* / European bullhead *Cottus gobio*; the monkey goby *Neogobius fluviatilis* / gudgeon *Gobio gobio*) facing two types of public cues (associated with frightened and foraging individuals) as a model to check if the invaders are more effective in public information use than the natives. Both invaders and the native gudgeon used danger cues from con- and heterospecifics, while the native bullhead failed to recognize heterospecific danger cues. The monkey goby and both native species appeared to be attracted to foraging cues from donors less likely to exert competitive pressure on the observer (i.e. the native species rather than potentially more aggressive invaders), while the racer goby appeared unable to correctly recognize heterospecific cues. Our results showed that public cues can enable invaders to read threats from a wide range of individuals and to find optimal food patches. This may contribute to their invasion success and further spread to novel environments.
This research was supported by the National Science Centre, Poland (Grant No. 2016/23/B/NZ8/00741).

Session 5 – Conservation issues and biological invasions

MULTIPLE INVASIONS, ECOLOGICAL OPPORTUNISM AND EFFECTS ON POND BIODIVERSITY OF A MAJOR AMPHIBIAN INVADER, THE MARSH FROG

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Amphibians are declining globally but some species contrast in expanding and invading broad-scale areas after introductions. Whereas some of these biological invasions have been well documented, such as in cane toads, others, more cryptic, are often underestimated despite multiple local warnings. This is the case of marsh frogs, a group of *Pelophylax* water frogs, for which there is a lack of an integrative overview of their invasion patterns, ecology and risks to biodiversity. To fill this gap, we carried out an inter-disciplinary study in phylogenetics, spatial, trophic and thermal ecology. We found out that introductions involved dozens of localities and many lineages, originating from three continents, fitting well with the history of importations of live frogs in Europe. They gave rise to nation-wide invasions, facilitated by the wide ecological tolerance of marsh frogs and resulting in large spatial niche overlaps with native amphibians. The establishment of the invaders was facilitated by their wide thermal tolerance and optima for high temperatures in a context of global warming. In invaded pond environments, alien marsh frogs showed a high trophic opportunism, predating on most native amphibians but also on many invertebrate taxa. Although the composition of freshwater communities was not globally altered across density gradients of marsh frogs, the invaders preyed heavily on some key predatory taxa and may particularly threaten vulnerable species such as tree frogs. Altogether, these results rank the marsh frogs as one of the most complex and opportunistic invasive amphibian species in the world. They call for the conservation of vegetated ponds to buffer the impact of invaders as well as a complete commercial ban on importation of live water frog to prevent the opening of the pandora box which may result from the combinations of multiple lineages in invaded territories.

Session 6 – Pathways and dispersal of invasive species

PROPAGULE PRESSURE FROM HISTORIC U.S. PLANT SALES EXPLAINS ESTABLISHMENT, BUT NOT INVASION

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Introduction history, consisting of propagule pressure and residence time, has been proposed as a primary driver of biological invasions. However, it is unclear whether introduction history influences all stages or just the establishment stage of invasion. Using a dataset of plant species introduced to the contiguous United States through the ornamental plant trade from 1719 to 1978, we investigated how introduction history relates to likelihood that a species will establish or invade. Based on a binomial generalized linear model, we found a significant effect of both propagule pressure and residence time on establishment, but only a marginally significant effect on invasion. Similarly, AUC analysis showed that propagule pressure and residence time were fair predictors of establishment, but poor predictors of invasion. Propagule pressure outperformed residence time in predicting establishment. Species were more likely to have successfully established if they were historically introduced to only eight unique locations. These findings indicate that propagule pressure through the ornamental trade predominantly influences non-native plant establishment. This suggests that other characteristics, such as plant traits, are a more important predictor of whether a species will become invasive than introduction history.

Session: Session 1 – Risk assessment and management of invasive species

ASSESSING INVASION RISKS USING EICAT-BASED EXPERT ELICITATION: APPLICATION TO A CONSERVATION TRANSLOCATION

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Conservation translocations are widely used to recover threatened species, but can pose risks to recipient ecosystems, particularly in the case of conservation introductions. Because of limited data and uncertainty, risk assessments for such projects often rely on extrapolated evidence and expert opinion, further complicating decision making.

The Environmental Impact Classification for Alien Taxa (EICAT) serves to classify the realised impacts of invasive species. We developed a protocol combining EICAT and formal expert elicitation to predict these impacts. We applied our protocol to the extinct-in-the-wild sihek (Guam kingfisher; Todiramphus cinnamominus), for which introduction outside the known historical range is being considered. We elicited from multiple experts probability estimates of impact levels across four impact mechanisms and five candidate release sites. We aggregated estimates using simulation-based and Bayesian approaches, with and without accounting for expert confidence.

Experts generally agreed that sihek introduction might impact the recipient ecosystem through predation, competition, and disease, although they disagreed about the likely impact levels. Releases to Palmyra Atoll were considered to pose the lowest risk across candidate sites, so this site was selected for further detailed ecological assessments and risk mitigation efforts.

EICAT, with its standardized impact mechanisms and definitions, helped reduce the linguistic uncertainty and subjectivity common to expert-based assessments. Expressing judgments as probabilities allowed us to evaluate uncertainty transparently and to assess the weight of expert confidence on the overall risk estimation. Formal quantitative elicitation and aggregation then allowed a transparent evaluation of results, facilitating communication with stakeholders and decision-makers.

Session 6 – Pathways and dispersal of invasive species

A NEW TOOL TO PREDICT THE SPREAD OF ALIEN SPECIES BETWEEN ANY TWO POINTS WORLDWIDE THROUGH HUMAN TRANSPORT ON LAND AND WATER

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Predicting biological invasions remains one of the key challenges to effectively mitigate the impacts of invasive alien species. Despite the increasing efforts of the past decades, however, due to the complexity of the systems involved, predicting biological invasions remains a challenge. A major caveat of many previous attempts is that they rely on a regional geographic scale, while predicting biological invasions requires the combination of local and global scales.
Here we present a new tool of predicting biological invasions being developed as part of the BioImpact project, which sits at the crossroad between academic research and real-life economy. The ultimate goal of BioImpact is to estimate the influence of individual companies on the environment, with a major focus on the spread of alien species worldwide. As part of this work, a tool was developed with the objective to estimate the probability of biological invasions due to human-mediated transport, from any location on land to any other location. As a first step, the shortest path between any two points worldwide is determined based on data from OpenStreetMap and the global shipping network. Thus, the tool integrates land-based and marine transport to identify the shortest paths on land and water. This information is then supplemented with environmental and geographic information to estimate the probability of biological invasions. In close collaboration with companies, the tool will be developed further to integrate real-life company data such as supply-chain information and import-export location and routes, providing insights about the risk of biological invasions in any area of the globe and allowing to estimate the companies' influences on the spread of alien species.

Session 6 – Pathways and dispersal of invasive species

SHIFTING DYNAMICS IN THE BAY OF CADIZ: CAN THE NATIVE GREEN CRAB WITHSTAND THE BLUE CRAB INVASION?

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Can the native European green crab (*Carcinus maenas*) withstand the invasion of the Atlantic blue crab (*Callinectes sapidus*) in the Bay of Cadiz? Invasive species pose significant threats to ecosystem functions, often outcompeting and displacing native species. We investigated the recent invasion of blue crab, comparing the population dynamics of these two species within the Bay of Cadiz from January-December 2023. Our hypothesis is that size-mediated competition and opportunistic feeding allow the invasive blue crab to outcompete the native green crab. This study focused on their differential distribution, size, weight, sex ratios, abundance, biomass, and the influences of prey and environmental conditions. We collected crabs and associated environmental data from a salt marsh estuary (locally called Estero Natural) with distinct fish and oyster culture sites using fyke-net traps. Our initial observations suggest the blue crab population, first observed in this salt marsh system from May 2023, has rapidly increased and dominated at the most productive fish site with its diverse prey resources. Meanwhile, the green crab remains abundant at the oyster site throughout the year. Notably, despite lower numbers, blue crabs exhibit significantly higher biomass at both locations, potentially due to their larger size. Correlation analysis of prey communities supports our hypothesis, showing higher abundances of bivalves, polychaetes, and certain crustaceans at the fish site, with less abundance in the oyster site. Environmental variables (especially temperature, salinity, and dissolved oxygen) differed between sites and correlated with crab population. Understanding how invasive species disrupt food webs within changing environments is crucial for developing management strategies. This study provides insights into the early stages of invasion and its ecological consequences within the Bay of Cadiz. Further research is needed to explore the long-term impacts of this invasion to understand the structure and function of this estuarine ecosystem.

Session 5 - Conservation issues and biological invasions

STABLE ISOTOPE ANALYSIS REVEALS FISH JUVENILES AS A TEMPORAL DOMINANT IN THE DIET OF INVASIVE PUMPKINSEED (*LEPOMIS GIBBOSUS*)

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The pumpkinseed *Lepomis gibbosus* (Linnaeus, 1758) is a small centrarchid fish species, originating from North America, that has invaded most European basins, with pronounced expected impacts. Analyses of pumpkinseed diet in its invasive range show macrozoobenthos as the most common dietary item, suggesting a competitive effect on native fish communities. All non-native dietary studies so far, however, have relied on gut content analysis (GCA), which can severely underestimate predatory effects. Our study 1) uses a combination of GCA and stable isotope analysis (SIA) to document pumpkinseed diet at two different sites (borrow pit, oxbow) in its invaded range, and 2) relates pumpkinseed diet preferences with parasitic load. SIA revealed juvenile fish as a major prey item at the oxbow, while macrozoobenthos domination at the borrow pit. On the other hand, GCA showed pumpkinseed preying mostly on macroinvertebrates (chironomids, gastropods, Ephemeroptera and Zygoptera larvae) at both sites. While infrequent infection by trophically-transmitted parasitic nematodes could be related to low consumption of zooplankton, substantial infection by metacercariae of *Posthodiplostomum centrarchi* Hoffman, 1958 appears to reflect relatively high consumption rates of its intermediate host, physid snails. The difference in results of two different approaches in fish diet analysis shown by our study emphasise the need for combining multiple methods when studying the impact of non-native species on food webs.

Acknowledgement: This study was supported by CSF project No. 20-29111S.

Session 5 – Conservation issues and biological invasions

NEWLY CONSTRUCTED SMALL WATER BODIES IN AGRICULTURAL LANDSCAPE: FROM BIODIVERSITY SUPPORT TO RESERVOIR OF NON-NATIVE SPECIES

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Building small water bodies (SWB) recently became a popular measure for water retention in Czech agricultural landscape. Majority of the SWB built from public sources proclaims biodiversity preservation as one of the main purposes, especially as regards biodiversity of amphibians and invertebrates. Such SWB are constructed without outlets and they do not contain planned fish stock. In 2022 and 2023, we have conducted a detailed survey of 123 newly (1-12 years) constructed SWB. Our survey showed that 58 % of these SWB was inhabited by fish and 80 % of them (47 % of all SWB) hosted non-native fish species. Topmouth gudgeon (*Pseudorasbora parva*) and Prussian carp (*Carassius gibelio*) were the most common non-native species, both occurring in 26 % of the SWB, a frequency matched only by native rudd (*Scardinius erythrophthalmus*). When present at a site, non-native fish assemblages reached significantly higher densities and relative biomass, compared to native fish assemblages, and negatively affected water quality and assemblages of amphibians and invertebrates. The invasions of non-native fish species into newly constructed SWB appear to be facilitated by lack of predators, relatively harsh environmental conditions and partly also by anthropogenic factors. Given that the construction of SWB does not allow water level manipulation, management options are limited and the SWB now often serve as reservoirs for further spread of the non-native fish.

Acknowledgement: This study was supported by TA CR project No. SS06010189.

Session 4 – Socioeconomic impacts of invasions

SOCIAL-ECOLOGICAL NETWORK MODELING OF MARINE FISH INTRODUCTIONS IN THE PANAMA CANAL

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Species introductions have spiked over the past two centuries due to globalization. Aside from the impact that such introductions have on ecosystems, they also have long-term implications for human communities. In the Panama Canal, one of the world's bustling hubs for global shipping, a recent canal expansion has coincided with a marked increase in marine fish species invading the freshwater portion of the canal (i.e. Lake Gatun). These invasions can impact the lake's fishers who depend on that ecosystem for their livelihoods. In this context, social-ecological network (SEN) modeling can be a powerful tool to understand the combined impacts of introductions on ecosystems and societies. This study, using information from interviews with key stakeholders and available ecological data, constructs two SENs to characterize how both the aquatic ecosystem and the fishing communities of the canal have changed after the expansion and the subsequent rise in marine fish species incursions. We found that the post-expansion network was less connected with a lower diversity of income sources for fishers, making the network likely to be less resilient than before. Local fishers widely reported sharp increases in populations of marine species coinciding with a decline in their catch of historically targeted species such as Peacock Bass, and many attributed this to those marine species predating on Peacock Bass, Tilapia, and native freshwater fish species. Network indices revealed differences in diversity of species targeted between fishing communities, and thus variable susceptibility to economic impacts from ecosystem changes as a result of marine fish entry. Only a few previous studies have applied an SEN approach to aquatic invasions. This work thus contributes to a small but important body of literature on studying bioinvasions from a social-ecological perspective.

Session 5 – Conservation issues and biological invasions

HOW (NOT) TO USE GENETICS TO ASSESS NATIVENESS

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The nativeness status of several species in given territories remains unclear, particularly when putative introductions would have occurred in distant pasts. In these cases, solid narratives supporting native or non-native status should rely on integrating knowledge from multiple disciplines, including archaeology, history, anthropology and different branches of natural sciences (biogeography, genetics). Each of these approaches have its own limitations, which should be acknowledged, especially when supposedly contradictory results are presented.
The Italian crayfish (*Austropotamobius fulcisianus*) has been traditionally considered native to Spain, and is managed as such. However, evidences solidly show that the species was introduced from Tuscany to the Spanish court in the late-16th century, since: i) there is historical information of crayfish absence; ii) there is no vernacular term for crayfish in Iberian languages; iii) first mentions of crayfish in Spain are linked to the royal family; iv) lack of ectosymbiont branchiobdellians; and, above all, v) the written evidence of crayfish importation (in February 1588) fits well with the present-day distribution of *Austropotamobius* evolutionary lineages.
Recent works using mitochondrial DNA sequences have claimed that the Italian crayfish is native to Spain, emphasizing the number and exclusiveness of haplotypes. However, none of these features are informative indicators of native status. Following that rationale, the red swamp crayfish (*Procambarus clarkii*) should also be considered native to Spain. It is not so because we know the origin, date and people involved in its introduction, which is exactly what we know of the Italian crayfish import. The notably unbalanced nature of currently available sequence datasets, with many more Spanish samples than Italian ones, could have hindered the interpretation of genetic patterns. However, the study of haplotype networks is a robust approach to assess nativeness, and the nested position of Spanish haplotypes among Italian ones clearly reinforces its non-native status

Session 5 – Conservation issues and biological invasions

FIELD STUDIES OF ECOLOGICAL IMPACTS OF INVASIVE PLANT SPECIES IN EUROPE

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We present the first harmonized database that compiles scientific evidence of the ecological impacts of invasive plant species at the continental scale. We summarize results from 266 publications reporting 4,259 field studies on 104 invasive species in 29 European countries. For each study, we recorded whether the effects were statistically significant and noted their direction (i.e., decrease or increase in the response variable when compared to uninvaded sites). We classified studies based on the impacts on the levels of ecological organization (species, communities and ecosystems), taxa and trophic level. Notably, one third of the studies focused on five invasive species (*Reynoutria japonica*, I*mpatiens glandulifera*, *Solidago gigantea*, *Carpobrotus edulis*, *Robinia pseudoacacia*). More than half of the studies were conducted in temperate and boreal forests and woodlands, and temperate grasslands. Impacts on native plants were more frequently studied than impacts on other taxa and trophic groups. Overall, 43% of the studies reported significant impacts, with more significant decreases (26%) than increases (17%) in the response variables. Significant impacts were more frequent on communities than on species or ecosystems and on plants than on animals or microbes. This database is of interest for academic, management and policy-related purposes.

Session 6 – Pathways and dispersal of invasive species

COMPLEX SELECTION PROCESSES PUSHING THE REDCLAW CRAYFISH INVASION FRONT IN THE ZAMBEZI FLOODPLAINS ECOREGION

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Understanding the eco-evolutionary processes which drive phenotypic variability in non-native species is crucial to predicting impact and informing spatially explicit management models. Invasion gradients provide experimental arenas to understand complex drivers of establishment success and ecological impacts. Here we present a case study using Redclaw crayfish, *Cherax quadricarinatus*, and possible avenues of future research to disentangle dispersal processes in biological invasions over space and time. We test in the field whether there is an invasion front effect in the Barotse floodplain invasion (Zambezi floodplains) and disentangle whether these effects are related to environmental filtering, spatial sorting, or density dependent processes along a non-linear 200 km invasion gradient over seasonal hydrological periods. Crayfish spread up- and down-stream indicated an expanding population compared to the former invasion front in 2019, facilitated by both sexes. Wet season detection probability and relative abundance were comparatively lower than in the dry season. No signals of environmental filtering were detected because of high habitat connectivity in the wet season. The invasion front population was characterised by lower relative abundance, lower body condition, larger overall body size and chelae size and longer front leg length. There was no effect on sex ratio. This indicates that spatial sorting, density dependent processes and predation pressure are acting as selective forces on phenotypic variability across the invasion gradient. Better understanding of the effects of flood regime and trophic interactions on phenotypic variability and dispersal is urgently needed. Population suppression to reduce spatial sorting and conspecific competition could be a viable management option at the invasion front.

Session 1 – Risk assessment and management of invasive species

COMPARISON OF THE ATTACHMENT STRENGTH OF INVASIVE QUAGGA AND ZEBRA MUSSELS FROM THE RHINE RIVER DEPENDING ON SUBSTRATE TYPE AND WATER VELOCITY

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Dreissenids (D*reissena polymorpha* / zebra mussel, *Dreissena rostriformis bugensis* / quagga mussel) are freshwater bivalves native to the Ponto-Caspian region and considered as invasive species in Europe and North America. They can greatly impact natural and industrial environments since they can grow rapidly in large biomass and attach easily to most submerged substrates. The main objective of this study is to compare the attachment strength between zebra and quagga mussels for different substrates and water velocities (from 0 to 0.5 m/s) in laboratory experiments. In still water, the attachment strength of mussels was measured at 1, 3, 7 and 15 days of fixation on stainless steel and concrete substrates to determine the time required for zebra and quagga mussels to reach their maximum attachment strength. As this maximum value was reached after 7 days for both species, the attachment strength was then measured at 7 days for all current velocities (0, 0.2, 0.3 and 0.5 m/s) on several substrate types (concrete, stainless steel, sanded, and unsanded plexiglass). These laboratory results were compared with measurements of attachment strengths in a natural environment (the Rhine River near the city of Strasbourg). The first results showed that in still water the attachment strength was stronger on the roughest substrates for both species (concrete: 1.5±0.5 N; sanded plexiglass: 0.8±0.4 N; steel: 0.5±0.3 N: unsanded plexiglass: 0.2±0.1 N) with no significant difference between zebra and quagga mussels. In running water, the attachment strength of the quagga mussel increased with increasing water velocity in contrast with zebra mussels, which might be due to different hydrodynamic properties between the shells of the two species. Perspectives of this work are to better understand the development of dreissenid mussels in industrial environments to develop more effective control strategies.

Session 6 – Pathways and dispersal of invasive species

NATURALIZATION OF ORNAMENTAL PLANTS IN THE UNITED STATES DEPENDS ON CULTIVATION AND HISTORICAL LAND-COVER CONTEXT

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Cultivation by humans is the primary mode of introduction for naturalized plants and an important driver of naturalization. Historical records of cultivated plants can represent introduced species pools and propagule pressure, allowing for tests of how species traits and environmental context affect naturalization while accounting for human influence. Ruderal traits, which generally promote naturalization, may not be universally advantageous across closed vs. open landscapes (forest vs. grassland/shrubland) or different agricultural land-use conversion types, though such context-dependence has not yet been demonstrated at a broad scale. We analyzed the naturalization of 3,949 cultivated ornamental non-native plant taxa that were for sale in nursery and seed catalogs in the conterminous United States during a period over 200 years to test for context dependence between traits associated with ruderality (short lifespan, shade intolerance, and self-compatibility) and estimates of historical forest/grassland cover and agricultural land-use change. We found that present-day naturalization was closely tied to longer cultivation duration and greater cultivation extent. While ruderal traits tended to promote naturalization, perennial lifespan and shade tolerance favored naturalization in US states with higher forest cover, which is consistent with an alternative invasion strategy in forests. Land-use conversion to pasture and succession of abandoned agricultural land promoted naturalization of disturbance-adapted plants in both forest and grassland landscapes. Our results emphasize the central role of cultivation in plant invasion and provide spatially and temporally extensive evidence that, while ruderal traits are important predictors of naturalization, they are dependent on the landscape context into which plants are introduced.

Session 2 – New tools and approaches for detection and monitoring

DETECTION OF INVASIVE AND ALIEN LAND PLANARIANS AS THREATS TO AGRICULTURE AND ECOSYSTEM STABILITY

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Alien land planarians are considered potential threats to European agriculture and ecosystem stability. Severe impact of alien land planarian species in Europe but also worldwide was reported including depletion of local and native soil invertebrates and possible detrimental changes at the ecosystem level. Given the increasing number of studies reporting non-native and potentially invasive species of geoplanid planarians, further action in first response related to worldwide plant trade is called for. To date, the only flatworm on the list of "Invasive Alien Species of European Union Concern" is the New Zealand flatworm *Arthurdendyus triangulatus*.

To help authorities detect and prevent introduction of the New Zealand flatworm, we designed an experiment in order to develop a species-specific barcoding protocol to check possible contamination by *A. triangulatus* of containerised flowerpots, identified as the most probable source of its co-introduction to non-native region.

Based on our results, specific behavior of *A. triangulatus* staying restricted to the surface and upper layer of the flowerpot determines accessibility of DNA in the soil. Therefore, water-based eDNA methodology combined with a newly established qPCR protocol is preferred as it provides a sensitive approach for detection of *A. triangulatus* in the flowerpots. Further testing is needed to determine sensitivity of the persistence of eDNA following the flatworm's removal, to estimate the risk of false positives.

The newly designed barcoding protocols provide species-specific diagnosis of one invasive and three non-native land planarians currently being assessed for their invasion risks. However, the species-specificity of the developed barcoding protocols might need to be re-evaluated in case of introduction of new planarian species, and in view of apparent misidentifications regarding published genetic resources. Instead, general protocols requiring genetic sequence analyses would offer a more robust approach to assess species diversity of introduced and potentially invasive land planarians.

Session 2 – New tools and approaches for detection and monitoring

INVASIVE NON-NATIVE SPECIES LEGISLATION REQUIRES INSPECTION TO BE EFFECTIVE

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While invasive non-native species legislation has been enacted around the world, it is unclear to what extent these laws are monitored and enforced. In other biosecurity disciplines, such as plant and animal health, this is done by inspectorates.
The establishment of a new, dedicated non-native species inspectorate (NNSI) in Great Britain has provided an opportunity to investigate compliance with non-native species law and explore the benefits of active investigation and enforcement.
Between February 2022 and April 2024, the NNSI carried out 1,271 systematic inspections of eight key sectors involved in the trade and keeping of regulated invasive species. Widespread legal non-compliance was found, with the highest rates in zoos (33%), rescue centres (17%), garden centres (8%) and pet shops (8%).
The NNSI also inspected boaters and anglers in GB for contamination of equipment with pooled water or organic matter, as well as containers at the border containing live organisms. In total, 28% of boaters, 14% of anglers and 15% of containers were contaminated.
Alarmingly, these non-compliance rates suggest that well over 1,000 premises / individuals are routinely breaking non-native species legislation in GB and more than 500,000 contaminated units (containers, anglers or boaters) are entering the country every year.
Legal non-compliance has improved across sectors since the establishment of the NNSI, with overall non-compliance dropping from 16% in 2021-22 to 7% in 2023-24. Awareness of the law and fear of being detected appear to be the main causes for improvement.
This study provides a stark warning that non-compliance with non-native species law is widespread, despite well-established legislation. There is no reason to suspect that Great Britain differs from other countries in this respect. Inspection is a rapid and effective tool for increasing compliance. Without it, non-native species legislation is unlikely to achieve its aims.

Session 1 – Risk assessment and management of invasive species

SEED BANK DYNAMICS OF *LUDWIGIA* SPP. – INVADED ECOSYSTEMS IN BELGIUM

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Invasive Alien Aquatic Plants (IAAPs) are recognized as one of the major threats to aquatic biodiversity globally. Because of their high growth rate and ability to form dense mats, these plants strongly impact biodiversity and conservation status of aquatic ecosystems. In Belgium, the invasive water primroses *Ludwigia* spp. Are listed on the Invasive Alien Species blacklist, and conventional management actions (manual or mechanical removal) have been conducted, but successful control stories are rare. As soil seed banks represent a source of propagules for both native and alien species, it is composition could trigger re-invasion or suppress recovery of native species, hindering restoration efforts. We explored these questions by using germination experiments and seed bank emergence assays from invaded, managed and near-pristine ecosystems in Belgium, combined with flora inventories. Our study found that (viable) Ludwigia seeds were produced in 75% of the sampled populations, with an overall germination rate of 50 ± 1% in controlled conditions. Half of the germinated seeds germinated within 19 ± 1 days. At the population level, germination varied from 4±45% to 77±12% of germinated seeds. An ongoing emergence experiment – where core sediments were taken in the selected ponds, sieved, and spread on a layer of sand under two hydrology regimes to allow germination of submerged, floating and emergent species from the seed banks – points towards a negative effect of Ludwigia germination on the emergence and/or persistence of native flora. We highlight that *Ludwigia* spp. populations may produce viable seed banks, which is not yet taken into account in the management plans. Our results thus underline the need for a more integrated management that considers seed bank dynamics for a targeted, efficient approach.

Session 2 – New tools and approaches for detection and monitoring

CITIZEN SCIENCE PLATFORMS CAN EFFECTIVELY SUPPORT EARLY DETECTION OF INVASIVE ALIEN SPECIES ACCORDING TO SPECIES TRAITS

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Early detection and rapid response are essential to deal effectively with new introductions of invasive alien species (IAS). Citizen science (CS) platforms for opportunistic recording of species have the potential to harvest their data for early detection of IAS, but this has not been tested. We evaluated the effectiveness of CS platforms for early detection of IAS by obtaining data on 707 species x country combinations from Europe where there was both an official first record (i.e. published in scientific literature or by a government agency) and a record in a CS platform. We tested how the difference between the two (CS time lag) was related to species traits, popularity in CS platforms, public and research attention and regulatory status. We found that for 50% of species x country combinations the time lag was zero or with CS being earlier than the official record. Although we cannot determine causality (the first official record could have been from a CS platform, or contemporaneous with it), this demonstrates the relevance of CS platforms for early detection. The time lags were affected by species traits rather than the overall activity of citizen platforms per country. Compared to official records, vertebrates were more likely to have earlier records on CS platforms, than plants or invertebrates. Greater popularity of the IAS in CS platforms and its observation in neighbouring countries resulted in earlier CS reporting, while its inclusion in the EU priority list resulted in earlier official recording, reflecting the efficacy of targeted surveillance programmes. These findings demonstrate how CS platforms are a valuable source of information on early detection of IAS. However, there is still room for improvement to connect CS platforms with IAS surveillance including greater acknowledgement of the role of citizen scientists and a better data flow from CS into global databases.

Session 1 – Risk assessment and management of invasive species

LONG-TERM SUBLETHAL EXPOSURE TO POLYETHYLENE AND TIRE WEAR PARTICLES: EFFECTS ON RISK-TAKING BEHAVIOUR IN INVASIVE AND NATIVE FISH

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Anthropogenic polymeric particles pollute even the most remote ecosystems and may compromise organisms' behaviour and movement skills. It is expected that invasive species cope better with pollutants than native species (i.e., pollution resistance hypothesis). In this study, invasive gibel carp (*Carassius gibelio*) and native crucian carp (*Carassius carassius*) were used as model organisms. Specimens were fed daily with food pellets (1 % body weight) added with 0.1 % polyethylene (PE), tire wear particles (TWPs) and control. Their behavioural parameters were compared before and after 14 and 60 days of exposure. Additionally, we evaluated burst swimming capacity after 60 days of exposure to the treatments. The fishes exposed to the PE and TWPs treatments showed significant trends toward increased boldness scores and, in the PE treatment, higher utilization of the open field, and both behavioural changes are associated with higher risk-taking. Invasive gibel carp had substantially better swimming performance than crucian carp, but the expected trend in relation to the treatments was not found. Fish exposed to sublethal doses of PE and TWPs showed signs of behavioural changes after two months of exposure that may affect risk-taking behaviour, which might impact species interactions with predators.

Session 3 – Global change and invasions

SEASONAL VARIABILITY IN THE TROPHIC ECOLOGY OF THREE CO-OCCURRING INVASIVE CRAYFISH AT A THERMAL LOCALITY

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Invasive crayfish pose several ecological impacts to the communities where they are introduced. Understanding the trophic interactions between co-occurring invasive crayfish is thus crucial to understanding the mechanisms underlying their co-existence. Here, we investigated the diet and trophic niche of three invasive crayfish species (the marbled crayfish *Procambarus virginalis*, the red swamp crayfish *Procambarus clarkii* and the spiny-cheek crayfish *Faxonius limosus*) from two sections of a thermal stream in Hungary over the four seasons using carbon and nitrogen stable isotopes analysis. The upper section, close to a thermal spring, is characterized by a considerably higher water temperature during winter compared to the lower section, while in summer the pattern is reverted. This results in a much higher water temperature variability in the lower section compared to the upper one. We found that all crayfish species tended to occupy a trophic position attributable to an omnivore in all sections and seasons, except on some occasions where the trophic position was more predatory. The isotopic niche width and structure did not show any clear pattern across species, seasons, or sections. Moreover, we found interspecific differences in the trophic niche in almost all seasons and sections, although some niche overlap between different species occurred in some seasons and sections. We also found interseasonal differences in the trophic niche of all species in both sections. These niche shifts are confirmed by the results of the mixing models, showing spatial and temporal changes in the diet composition. Our results suggest that these three non-native crayfish populations tend to avoid interspecific competition by partitioning their trophic niches and changing their diet according to seasonal and local prey availability. Our study provides valuable information on how invasive crayfish may respond to climate change-induced environmental changes, which may be useful to improve their management and impact mitigation.

Session 2 – New tools and approaches for detection and monitoring

MONITORING NON-INDIGENOUS MOBILE SPECIES IN PORT HABITATS USING A STANDARDIZED AMERICAN PROTOCOL

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The introduction of non-indigenous species (NIS) into marine environments is widely recognized as a significant contributor to global environmental changes, with maritime traffic serving as a key vector for dispersal through mechanisms like ballast water and biofouling. Ports, as central hubs for maritime activities, play a critical role in the introduction and spread of these species. However, the monitoring of NIS in ports is hindered by a lack of standardized methodologies across European countries. In this study conducted in the Gulf of La Spezia (Ligurian Sea, Italy), we applied the Smithsonian Environmental Research Center (SERC) protocol, originally designed to assess changes in fouling community structure over time and space. While primarily focused on sessile assemblages, our study aimed to evaluate its effectiveness in detecting mobile species. We selected five port sites and deployed 10 PVC panels (14×14 cm), immersing them for three months annually during the summer season over six years (2018-2023). During laboratory analysis of the sessile components, mobile specimens were also sorted and morphologically identified. Across the study period, approximately 70 taxa were identified, including 11 NIS, spanning various taxonomic groups such as Platyhelminthes, Nemertea, Annelida, Mollusca, Crustacea, Pycnogonida, Echinodermata, and Mysidacea. Notable findings included the emergence of new Mediterranean arrivals like the Pacific amphipod *Aoroides longimerus*, along with significant abundances of amphipods *Laticorophium baconi* and *Caprella scaura*, and the isopod *Paranthura japonica*. The study revealed variability in NIS richness and abundance among sites and over the years, with effective detection of non-indigenous peracarids. While the SERC method proved suitable for studying mobile fauna, further comparative studies could optimize its effectiveness for this specific component. This research highlights the importance of standardized monitoring protocols in ports to better understand and manage the impacts of NIS introductions in marine environments.

Session 3 – Global change and invasions

INVESTIGATING CURRENT LIMITS TO PLANT INVASIONS IN NORTHERN CANADA

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Invasions by non-native plants are frequent in temperate regions, but tundra and boreal forest ecosystems remain relatively uninvaded. This pattern is beginning to change as non-native plants increasingly are establishing at high latitudes in both the Northern and Southern Hemispheres. Churchill, Manitoba (58°N), at the boreal-tundra transition on the west coast of Hudson Bay, is a unique study site for northern invasion research. Remarkably, more than 100 non-native plants have been recorded locally, reflecting this town's history as a rail link and grain port. Although some non-native species have persisted for decades in human-disturbed areas, none has spread from town into nearby subarctic tundra and boreal ecosystems. We are using field experiments to understand what factors currently limit further colonization. Dispersal limitation may slow the spread of some species following their initial arrival in town; however, even when seeds or roots of locally-occurring non-natives are experimentally planted in disturbed tundra and boreal sites, establishment is poor. Performance generally is better in boreal than in tundra sites, indicating that the boreal forest may be more easily invaded if dispersal barriers are removed. Germination and initial growth can be improved by increasing temperatures with temporary greenhouses; enriching soil also improves performance in some cases. These results suggest that the presence of invaders in town reflects a combination of anthropogenic influences including increased propagule pressure, disturbance, warmer microsites, and enriched soils. As high latitudes continue to warm and human travel and impacts on natural ecosystems increase, it is unclear whether this dependence will persist. In future, sites like Churchill may become hotspots for northern invasions.

Session 6 – Pathways and dispersal of invasive species

NON-NATIVE FISH IN HUNGARIAN WATERS, HISTORICAL OVERVIEW AND RECENT TRENDS IN THEIR DISTRIBUTION

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In this presentation we provide a historical overview of the occurrence of non-native fish in Hungarian natural waters; and present the recent distribution patterns, abundance data and factors contributing to their spread using GIS. To date, information on the occurrence of 104 non-native fish species and hybrids from natural waters in Hungary is available. Based on the dates of first occurences, it can be assumed that the species number show increasing trend in recent years. This is supported by the fact that the vast majority of these species have also been reported from our natural waters in the last five years. In more than 1500 river sections surveyed in our field studies, we detected non-native species in nearly 80% of the study sites. Alien fish accounted for almost 30% of the species caught during the surveys, and 20% of the total number of individuals caught. In the small and medium watercourses, gibel carp, stone moroko and sunfish were the most common non-native species. Here, their abundance were mainly influenced by the altitude and the presence of fish ponds. In larger watercourses, Ponto-Caspian gobies are the dominant alien species, and their distribution may be facilitated by river navigation and the construction of the river-bank protecting rip-raps. In recent years, the number of aquarium species has increased exponentially. Due to their specific requirements, these species are currently found in larger numbers in thermal spring-fed river sections only, but their spread is expected due to climate change.

Session 5 – Conservation issues and biological invasions

PLANT INVASIONS IN THE KRUGER NATIONAL PARK: WHAT DO WE NEED TO KNOW AND HOW TO FIND IT OUT?

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A recent assessment of plant invasions in the Kruger National Park (KNP) identified 79 naturalized plant species, of which 21 are considered invasive, some of them globally widespread flagship invaders. Although many aliens occur in open savanna outside rivers and some are becoming widespread there, in general, the invasions by alien plants in the savanna ecosystem of South Africa primarily occur along rivers that serve as sources of propagules and dispersal vectors and provide suitable habitats for the establishment and spread of invaders. In KNP, three annual plant invaders from the Americas (*Xanthium strumarium*, *Datura innoxia*, and *Parthenium hysterophorus*) are of significant concern as they form large populations in river beds across the park and continue to spread. However, little has been known about their actual impact on the savanna ecosystem. Within the MOSAIK project (Monitoring Savanna Biodiversity in Kruger National Park), we adopted a comprehensive approach. We focused on a wide array of consequences of these invasions, quantifying their impacts on vegetation, soils, and herbivores. To generate a robust basis for efficient management interventions, impact data need to be coupled with information on the spatial extent of invasion. Towards this end, we employed light aircraft to map the distributions of the three target species in KNP along the five main rivers flowing through the park (Crocodile, Sabie, Olifants, Letaba, and Shingwedzi), using aerial photographs at ~7 cm spatial resolution; in addition, we monitored the between-year dynamics by repeated sampling in permanent transect plots. We argue that only complex information on various facets or the context of each particular invasion of concern can serve as a solid basis for targeted management that needs to stem from (i) knowing what are the threats that the invasive species presents to various components of the invaded ecosystem, and (ii) where are those threats likely to occur.

Session 6 – Pathways and dispersal of invasive species

NETWORKS OF RISK: INTERNATIONAL TOURISTS AS A BIOSECURITY PATHWAY INTO NATIONAL PARKS

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Tourists have been long recognised as vectors of alien microbes, plants, and animals into protected areas worldwide. Quantitative estimates of the risk from this introduction pathway have largely relied on surveys of invasive alien species associated with tourist clothing or transport vectors. Rarely has an opportunity arisen to view the larger scale flows of tourists across multiple protected areas within a region. The New Zealand International Visitor Survey provides unique insights into the movement of a sample of several thousand international visitors among the 13 national parks in the country. The robustness of visitation patterns was assessed by comparing trends in international visitor movements immediately prior to the closure of international borders due to the SARS-Cov-2 pandemic and again once the border had reopened. Approximately one third of international visitors only visited a single national park but over 20% visit five or more. The long tail in the frequency of visits to national parks highlights that a small number of international visitors play a greater risk of introducing or moving invasive alien species among different protected areas. European tourists tended to visit more national parks and were more likely to camp or stay in mountain huts, thus potentially posing a greater biosecurity risk. The largely montane or alpine nature of most national parks imposes a strong bioclimatic filter on alien species establishment and combined with stringent border controls, suggests international tourists pose a greater risk by disseminating already established alien species more widely among and within national parks. Network analyses highlighted geographic clustering of national parks based on tourist movements that might facilitate regional spread of alien species. Greater investment in the education of international tourists about the biosecurity risks they pose through spreading alien species into national parks is needed to address Target 6 of the Global Biodiversity Framework.

Session 3 – Global change and invasions

WHEN GLACIERS RETREAT, INVADERS ADVANCE: THE SPREAD OF INTRODUCED PLANTS AND INVERTEBRATES ON THE ISLAND OF SOUTH GEORGIA

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Climate change effects are marked on South Georgia, with rapid glacial retreat leaving increasing areas of bare land. While invasive mammals have been eradicated from South Georgia, the island continues to harbour introduced invasive plants and invertebrates, with some now so widespread that eradication is impossible. These species may profit from deglaciation by rapidly colonizing bare ground, potentially at the expense of resident native plants and invertebrates. We conducted detailed transect surveys in areas of varying time since deglaciation, and along altitudinal gradients, to establish whether invasive plants and invertebrates are colonising deglaciated land and higher altitudes more than native species. Introduced plants were well represented in deglaciation sites and two species (*Poa annua* and *Cerastium fontanum*) colonised early and frequently (occurring on more than 75% of transects surveyed). Introduced arthropods were also present around tidewater glaciers and at higher elevations, including an important predatory ground beetle (*Merizodus soledadinus*). Our study suggests that further local colonisation and spread of introduced species on South Georgia will be extremely likely as the climate continues to warm, which will lead to the formation of novel plant and invertebrate communities.

Session 3 – Global change and invasions

WORLDWIDE COMPARISON OF CARBON POOLS AND FLUXES BETWEEN COEXISTING NATIVE AND NON-NATIVE TREE STANDS

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Global warming due to anthropogenic CO_2 emissions is one of the main challenges for humanity. Given that forests are major natural carbon sinks, administrations worldwide are launching broad-scale tree plantation programs. Some of them do not distinguish between forests of native trees (NT) and plantations of non-native trees (NNT). Given that NT and NNT may widely differ in their carbon economy and in the allocation of carbon between above and belowground, the expansion of NNT may have profound impacts on the carbon cycle of forested lands and in the vulnerability of the carbon stocks to disturbances. In this study we compare carbon stocks and fluxes among coexisting forests dominated by NT and NNT by means of a worldwide meta-analysis. Given that NNT are often selected for their fast growth capacity, we expected NNT forests to have a faster carbon cycle, but less durability of carbon stocks than NT forests. After a systematic search, we compiled 1678 case studies from 255 published papers, with quantitative data of carbon cycle-related variables from coexisting NNT and NT forests. We covered 171 NNT species from 43 families, and 61 countries from all continents. NNT forests have larger carbon stocks and faster carbon fluxes than NT ones. Aboveground carbon stocks were considerably greater in NNT forests, but belowground carbon stocks, particularly soil carbon, were greater in NT forests. Among fluxes, carbon uptake rate was higher in NNT forests, while carbon loss rate did not differ between forest types. Some of these trends were affected by the type of climate, the age of trees, and management practices. Our findings indicate that promoting NNT forests may lead to an aboveground increase of carbon stocks, but also to a decline in the belowground. This may have far-reaching implications on the durability and vulnerability of carbon to disturbances.

Session 5 – Conservation issues and biological invasions

THE STAGE OF SUCCESSION IN THE POST-MINING VEGETATION DETERMINES THE INHIBITORY EFFECT OF BOTH NATIVE AND ALIEN SPECIES

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In spontaneously vegetated post-industrial areas, we have limited knowledge of whether the known inhibitory tendencies of *Calamagrostis epigejos* and *Solidago* spp. vary across successional stages. Our study fills this knowledge gap with the goal to assess the inhibitory role of the invasive alien and expansive native species with known behaviour from the literature. Specifically, we hypothesized: (i) there will be an inhibiting effect of these species on diversity across successional classes; (ii) the effect of a species will depend on the successional class due to intermediate disturbances and abiotic requirements of plant communities in each successional class. We recorded vascular plant species and their abundance across 400 plots on post-coal mine heaps in Upper Silesia, Poland. We classified spoil heaps into three successional classes (early-stage; mid-stage; late-stage). We calculated plant community taxonomic, functional, and phylogenetic diversity and, using generalized linear mixed-effects models, we estimated predictors of diversity indices across successional classes. While we found no limiting effects of these species on diversity indices across successional classes, the effects of a species depended on the successional stage. We found the impacts of *Calamagrostis* and *Solidago* cover on diversity indices in the mid-successional stage. This implies that the early-successional stage is controlled by the lottery model of community assembly. However, in the mid-successional stage, the competitive exploitation mechanism is evident, resulting in declines in diversity indices. Our findings can be applied to other invasive alien species and expansive natives with similar ecology niches to *Solidago canadensis*, *S. gigantea,* and *Calamagrostis*.

Session 2 – New tools and approaches for detection and monitoring

VALIDATING THRESHOLD INDICATOR TAXON ANALYSIS FOR IMPACT ASSESSMENT OF INVASIVE SPECIES

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Ceratium furcoides is a major invasive planktonic species in Neotropical inland waters, known for its extensive blooms linked to diverse phytosanitary, biodiversity, and socio-economic impacts, including massive fish kills and water quality deterioration. These issues often disrupt water supplies from drinking water reservoirs used for domestic and industrial purposes. Our aims were to determine the threshold values of abundance at which the invasive species has significant impacts on the native community and to test whether Threshold Indicator Taxon Analysis (TITAN), a method for detecting and interpreting ecological thresholds, can be validated as a method for assessing the impact magnitude of invasive species. Unlike TITAN, which relies solely on native phytoplankton community data and *C. furcoides* abundances, our validation incorporated deep learning methods and the abiotic variables: ammonium, dissolved CO_2, water temperature, conductivity, magnesium, iron, phosphorus, nitrate, and pH. We hypothesized that *C. furcoides* abundances are the primary drivers of richness and diversity loss in native phytoplankton, rather than the measured environmental conditions.
This hypothesis was confirmed over a five-year sampling period at a Brazilian drinking water reservoir during the early invasion stages of *C. furcoides*. We identified specific invasion thresholds where significant changes in phytoplankton biodiversity occurred and compared the outcomes from TITAN with those derived from deep-learning analyses incorporating abiotic factors. We found that increased *C. furcoides* abundances negatively affected native phytoplankton, with biodiversity declining above a threshold of ~400 cells/ml that was identified by both methods. Notably, biodiversity impacts were observed at Ceratium cell concentrations below typical bloom definitions. These findings suggest TITAN as an effective tool for identifying biological invasion impact thresholds, offering foresight for management strategies and risk communication enhancements in scenarios lacking comprehensive environmental data.

Session 3 – New tools and approaches for detection and monitoring

TEMPERATURE AFFECTS MEDITERRANEAN-SCALE VARIATIONS IN TROPHIC POSITION AND ISOTOPIC NICHE WIDTH OF THE INVASIVE ATLANTIC BLUE CRAB *CALLINECTES SAPIDUS*

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Together with bioinvasions, climate warming is recognized as a threat to the diversity of marine biota, rewiring food webs and ultimately eroding the integrity and stability of ecosystems. Among other abiotic factors, temperature is a major driver of the spatial distribution of marine ectothermic species, strongly influencing their physiology and metabolism, and altering individual performance and fitness. Specifically, in an omnivore consumer local thermal conditions should affect its energy requirements, influencing in turn its trophic position in the food web. Here, we focused on the Atlantic blue crab *Callinectes sapidus*, invasive in European coastal waters. Using CN stable isotope analysis, we calculated the trophic position and isotopic niche metrics in 13 blue crab populations distributed in the Mediterranean Sea from Spain to Turkey. Individual isotopic data were collated from the literature; trophic position and isotopic niche metrics were estimated using advanced Bayesian approaches, and their spatial variation was modelled using generalized additive mixed models where temperature-related climatic predictors were obtained from the online databases Marspec and Worldclim. Our results indicated a significant positive co-variation between the trophic position of the blue crab and the width of its isotopic niche, suggesting that an increase in individual dietary specialization might represent a buffering mechanism for intra-specific interference phenomena arising with shifts from omnivory towards fully carnivorous habits. In addition, we highlighted a significant, positive effect of temperature on both trophic position and isotopic niche width, implying that climatic conditions might have a role in determining the trophic habits of the species in invaded ranges and, ultimately, its local impact on native communities. Our findings shed light on potential large-scale drivers of the ecological impact of the blue crab across the Mediterranean area, giving hints on possible trajectories of change within invaded ecosystems in the climate change scenario.

Session 1 – Risk assessment and management of invasive species

POTENTIAL DISTRIBUTION OF AROMIA BUNGII, A NEW INVASIVE PEST IN EUROPE

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Aromia bungii Faldermann (Coleoptera: Cerambycidae) is a wood-boring beetle that primarily infests trees in the *Prunus genus*, including economically important crop species such as apricots, cherries, peaches, and plums. It is native to eastern Asia and was recently introduced to Japan, Germany and Italy. Its expanding distribution has triggered concern especially in Europe where it is now considered a priority quarantine pest. To estimate the potential threat, a first model of the potential distribution of the species was recently developed using Maxent and the WorldClim v2.1 bioclimatic variables. Variables that contributed most towards explaining *A. bungii* distribution were 'Precipitation of Warmest Quarter' (50.5%), followed by 'Mean Temperature of Coldest Quarter' (28.5%) and 'Precipitation Seasonality' (11.2%). Spatial predictions show highest climatic suitability for the species in China and Korea (native range), Japan (invaded range), Northern Myanmar, Butan, Nepal and Northern India. Lower suitability is predicted for Europe, North and South America, and to an even lesser extent for South Africa and Australia. When translating predicted probabilities into presence / absence according to a no-omission threshold (recommended in case of a high-risk pest) the model predicts favourable conditions for *A. bungii* that extend over a much larger area than its current invasive range. This suggests that several European countries are at risk, particularly those of southern and eastern Europe. Significant portions of the US and southern Canada are also predicted to be climatically favourable for *A. bungii,* highlighting the risk posed to North America. The current lack of physiological data on thermal tolerance of A. bungii hampers the development of a proper semi-mechanistic model such as Climex. However, a comparison of a Climex model obtained by an inductive approach appears to confirm suitability obtained by Maxent.

Session 2 – New tools and approaches for detection and monitoring

DOES FOULING SPECIES SELECTIVITY WORKS WITH/ON PLASTICS?

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The presence of plastic in marine environments can have significant negative impacts, as they can serve as vectors for the introduction of non-indigenous species (NIS), primarily by providing substrates for fouling organisms. Monitoring surveys are effective to implement prevention and management efforts when new NIS arrive and are not established, having low abundances and limited distribution. The application of recent methods of taxonomic identification such as metabarcoding can enhance the early detection of these species, facilitating the implementation of biofouling monitoring programmes and management strategies. In this study we aimed to characterize the fouling communities present on various types of plastic polymers, through an integrative approach, combining morphology and molecular-based identification methods. Plates with different plastic polymers were deployed at different depths: near-surface (0.5m) and near-bottom (12m), and distinct immersion periods (3 and 12 months), in Albufeira coastal Lagoon (W Portugal). The morphological identification of taxa was carried out using the standardized protocol developed by the Smithsonian Environmental Research Center, and the molecular identification using high-throughput sequencing metabarcoding of COI and 18S rDNA markers. A total of 24 taxa were morphologically identified, of which only 10 were identified to species level. From the 24 taxa, 8 were NIS, all of them previously reported in the Portuguese coast. Preliminary results indicated that the fouling communities were distinct between depths and immersion periods, but not between different plastic polymers. After 3 months of immersion there was a predominance of Serpulidae Polychaeta, while at 12 months colonial ascidians were dominant at the surface and *Mytilus* sp. was dominant on the bottom. The temporal differences in the fouling composition might be related to the annual artificial opening of the lagoon, seasonal variations in environmental conditions, and the species life cycles. Metabarcoding results are yet to be analyzed.

Session 3 – Global change and invasions

PLANTS THAT HAVE NATURALIZED AS ALIENS ABROAD HAVE ALSO BECOME MORE COMMON AT HOME DURING THE ANTHROPOCENE

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Throughout the history of life, natural processes have driven changes in species' range size and occupancy. In the last centuries, and particularly since the start of the Anthropocene, these dynamics have accelerated in response to anthropogenic changes occurring across species' native distributions. At the same time humans have introduced thousands of species beyond their historic range limits, and some of these establish self-sustaining populations (i.e. become naturalized). Although it is well documented that particularly plant species that are common in their native range have become naturalized elsewhere, how dynamics in native distributions relate to global naturalization remains unclear. To fill this knowledge gap, we retrieved grid-cell occupancy data of vascular plant species for 10 European regions that had such data for at least two periods, spanning decades to more than one century. For each of these regions, we calculated an occupancy-change index for each native species. We used hurdle models to relate this change index along with occupancy in the early period to the number of regions around the globe where the species is a naturalized alien (i.e. global naturalization). We found that global naturalization increased significantly with both the early-period occupancy and the occupancy-change index for nine of the ten native regions. Moreover, for three regions, the positive effect of the occupancy-change index was strongest for species that already had high occupancies during the early period. Our results provide the first evidence that many of the plant species that have expanded their global distributions as naturalized aliens are also expanding within their native ranges. These findings strongly suggest that many of the drivers of a species' global naturalization are the same as those that allow the species to thrive at home.

Session 3 – Global change and invasions

DATABASE ON THE GLOBAL HUMAN-MEDIATED INTRODUCTION OF VECTOR MOSQUITOES

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Mosquitoes (Culicidae), with over 3,726 species, significantly impact global health by transmitting vector-borne diseases (VBDs) like malaria and dengue fever, causing around 700,000 annual deaths. Their introduction into new regions, facilitated by global trade, human activities, climate change and urbanization, enables rapid spread to new areas where they may transmit new pathogens or participate in the transmission cycles of existing indigenous pathogens, contributing to the spread of VBDs. Monitoring invasive species is crucial for disease control, yet existing biodiversity databases have limitations, including data gaps and validation issues. Our study analyzed the global distribution of non-native mosquito species that serve as vectors for human diseases, tracking their first records in new regions and identifying their origins and introduction pathways through a comprehensive review of scientific literature. We found that 45 mosquito species, corresponding to 24.2% of all mosquito species known to transmit pathogens in the wild, have been introduced to non-native regions somewhere in the world. Of these, 28 (62.2%) were recorded as introduced for the first time after 1950. After 1900 the number of introductions showed a rapid increase, with nearly half of all first records occurring after 1950. We also found that in general the earlier the species has been recorded globally, the more new regions it has spread into. However, this does not yet apply to a large number of newly emerging species, with introduction records known only for one or two regions. Species native from Africa and Asia dominate intercontinental species exchange, while Europe and South America primarily receive introduced species. Post-1900 colonization trends show a shift in origin, with Asia, Australia, and the Americas contributing the most introduced species. By analyzing the temporal and geographic distribution patterns of these introduced species, our study provides valuable insights into the potential spread of disease and supports ongoing disease prevention and control efforts.

Session 2 – New tools and approaches for detection and monitoring

THE POWER, CHALLENGES AND INTEGRATION OF EDNA-BASED METHODS AS A CORNERSTONE FOR INVASIVE SPECIES MANAGEMENT

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Invasive species surveillance programs stand to gain significant advantages through the integration of environmental DNA (eDNA) based methods. These techniques provide valuable insights into the presence, abundance, and ecological impact of invasive species. Despite the maturity of eDNA-based methods, their adoption by decision-makers and managers has been slow. In this presentation, we aim to bridge this gap by addressing some key topics relevant to both invasive species managers and eDNA practitioners. We will demonstrate how eDNA analyses can be effectively integrated to improve early detection and quantification of invasive species, as well as to support eradication and conservation efforts in the field. Specifically, we will cover: i) strategies for enhancing the spatial and temporal resolution, as well as the robustness, of eDNA detection, ii) techniques for obtaining more precise estimates of abundance and population size using eDNA data alone, and iii) insights on how eDNA data can provide information about the potential impact of invasive species on native communities. These concepts will be illustrated with innovative examples from our eDNA research conducted on invasive species in freshwater systems in Belgium. Specific cases on species such as the American bullfrog, African clawed frog, Ponto-Caspian gobies, Oriental weather loach, Muskrat, and the invasive crayfish will be highlighted. Our ultimate goal is to empower invasive species managers to make informed decisions about whether, when, and how to utilize eDNA in their surveillance and eradication efforts. By understanding the strengths, challenges, and limitations of eDNA-based methods, managers can effectively leverage this approach to combat invasive species and protect native ecosystems.

Session: Session 1 – Risk assessment and management of invasive species

ENVIRONMENTAL DRIVERS AND PLANT BIODIVERSITY INFLUENCING *XYLELLA FASTIDIOSA* (XF) IMPACT ACROSS A MIXED AGRICULTURE-FOREST LANDSCAPE

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Invasive plant pathogens pose significant global threats due to their socioeconomic and environmental impacts. A paradigmatic example is *Xylella fastidiosa* (Xf), which has significantly impacted major permanent crops (i.e., olive and almond), with several recent outbreaks across Europe. While research has primarily focused on its effects on crops, there has been limited research on the positive and negative feedback with natural areas, where a large number of hosts have been identified, and how recent decline outbreaks are influenced by interactions with biotic and abiotic factors. We utilized GLMMs to examine Xf impact and its interaction with environmental drivers on almond orchards and surrounding vegetation in Alicante, Spain. Among 114 surveyed almond trees, Xf was detected in 37 via qPCR, exhibiting significant increases in defoliation and dead branches compared to non-infected trees. The effect of Xf on almond defoliation was mediated by environmental factors, having greater importance in areas with a higher abundance of Xf-host plant species in surrounding natural vegetation, seasonal evapotranspiration, as well as in almond orchards with higher understory scrub cover. In surrounding vegetation, leaf discoloration and dead branches in Xf host plants correlated with plant diversity, climate, and distance from orchards, albeit not with Xf presence in the neighbouring almond plots. Specifically, plant discoloration increased with high plant diversity and distance from orchards, while precipitation decreased it. Dead branches increased in areas with high plant diversity and distance from almond orchards. Potential evapotranspiration increased dead branches, while the heat load index had a negative effect. These findings highlight the direct correlation between almond tree health, Xf presence, and were influenced significantly by environmental conditions. This information could lead to better management strategies to mitigate Xf outbreaks' adverse effects on agroecosystems and surrounding landscapes.

Session: Session 6 – Pathways and dispersal of invasive species

CLIMATE-DRIVEN RANGE EXPANSION: ASSESSING *SIPHONARIA PECTINATA*'S RESPONSE TO RISING TEMPERATURES

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Climate change significantly impacts the physiology, ecology, and biogeography of both native and non-native species. A notable pattern among non-native species is their poleward expansion in response to rising global temperatures. Particularly, as winter temperatures increase in the mid to high latitudes of the northern hemisphere, these areas are becoming hotspots for the proliferation of warm-adapted non-native species. On the rocky shores of NW Iberia, subtropical and Mediterranean species, such as *Siphonaria pectinata*, have exhibited significant northward range expansions. This study aims to longitudinally monitor the distribution of *S. pectinata* and to conduct controlled laboratory experiments to identify critical temperature thresholds that could limit its geographical spread. To achieve this, we conducted biodiversity surveys in 2009, 2013, and 2019, recording the presence and abundance of the species along the Iberian Peninsula. Our results indicate a consistent northern expansion and an increase in abundance over time. Further, we experimentally exposed their eggs to low-temperature conditions and monitored larval development to determine thermal limits. Our findings identify a critical thermal tolerance threshold of approximately 10 ± 2°C, which likely serves as a key limiting factor in the species' distributional changes. This research advances our understanding of climate-induced shifts in species distributions and highlights the importance of evaluating cold temperature tolerances when predicting the expansion potential of warm-adapted species.

Session 5 – Conservation issues and biological invasions

INSIGHTS FROM STUDYING ONE OF THE WORSE AVIAN INVADERS IN THE WORLD

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Invasive species represent a significant threat to global biodiversity, yet the mechanisms of their proliferation remain incompletely understood. The common myna (*Acridotheres tristis*) stands out as a particularly successful and pervasive avian invader. While inflicting damage upon biodiversity worldwide, the common myna also serves as a model for investigating the drivers behind biological invasions. Our research examines both native and invasive populations of the common myna, aiming to track shifts in their distribution and unravel the drivers of their invasive success. Human-mediated activities play a pivotal role in expanding the global range of the common myna. Species distribution modeling indicates that the expansion of its distribution is mainly explained by proximity to urban areas. Not only do humans transport the species to new sites, but urban environments also offer conducive conditions for its proliferation. Within these urban habitats, we have observed adaptive morphological changes associated with foraging behaviors, indicative of rapid evolutionary responses to novel ecological niches. Moreover, our research reveals the remarkable cognitive faculties of invasive common mynas, as evidenced by their adeptness in motor innovation experiments. These experiments underscore the species' ability to exploit novel food resources inherent to human-altered environments. Additionally, our analyses of global patterns of myna predator-avoidance behaviors, using the Flight Initiation Distance assay, demonstrate reduced predator-avoidance response among invasive common mynas (compared to a local species), as well as in higher human densities and in more urban areas. Such diminished fear response enables the mynas to sustain foraging activities even in high human presence. These findings highlight the invasive potential and remarkable adaptability of the common myna in human-modified landscapes. Understanding the traits and mechanisms driving biological invasions is imperative for effective conservation strategies aimed at mitigating further biodiversity loss.

Session 5 – Conservation issues and biological invasions

BIOLOGICAL INVASIONS: THE HIDDEN SIDE OF THE POPULATION LEVEL

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Individual variation assessments are essential to understand population and community dynamics and ecosystem functioning. Although researchers have long recognized this aspect (e.g. Charles Darwin and Russel Wallace use the intraspecific variation as the foundation of the theory of evolution) only recently evidence accumulated about the ecological importance of variation within species. In fact, incorporation of individual variation provides a more complete description of the effects a species may have on ecosystems; however, this also increases the costs in laboratory and/or field sampling. Anyway, this detailed ecological knowledge can be especially important in the context of biological invasions. In this study, we use the signal crayfish *Pacifastacus leniusculus* in the Rabaçal River (NE of Portugal) along an invasion gradient (core vs. front) to assess possible intra-population differences in biological traits and ecological impacts. For this, we use field sampling to characterize several biological traits such as abundance, size structure, sex-ratio, physiological condition, personality and trophic niche. In addition, we perform two different laboratory experiments to assess possible differences regarding the consumption of prey, leaf mass loss and nutrient cycling. Crayfish from the invasion front have a different trophic niche, a lower abundance but are larger, dominated by males, have a higher physiological condition and are bolder and more aggressive. In addition, crayfish from the front consume more prey and more leafs and increase the concentration of nitrates and phosphates. Overall, the signal crayfish has different biological traits and has distinct ecological impacts along the invasion gradient. This study clearly demonstrates the importance of assessing biological traits and impacts of invasive species at the population level. Such an approach could improve and refine impact assessments with potential pay-offs in the development of more effective conservation and management strategies.

Session 6 – Pathways and dispersal of invasive species

DYNAMICS OF INTRODUCTION OF ALIEN FAUNA IN NEW CALEDONIA

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Target 6 of the Kunming-Montreal GBF calls for reducing the establishment of invasive species by 50% until 2030. However, we still know very few about how and when these species are introduced. In order to contribute to this exercise, we studied the dynamic of introduction of alien fauna in New Caledonia. Our dataset includes data on the taxonomy, dates of first records, pathways of introduction and functional traits for 1081 species introduced between 1889 and 2014. GLM selected human population as the only predictor and indicated a slow increase in the number of first records from 1889 (2.87) to 1969 (5.45), followed by a marked inflection and reaching a mean of 14.5 new records in 2014. The prediction for 2030 and 2050 showed that these numbers will continue to grow, reaching an average of 14.96 and 15.57 new records per year. Regarding pathways, nearly the totality of the introductions was unintended (1011 vs 70), and Pathway 3 "Transport-Contaminant" is by far the one with highest number of first records, and the only through which the number of first records significantly increase along time (GAM z value= 19.46; Pr(>|z|)=<2e-16). From the Pathways subcategories, only "Parasites_on_plants" presented a positive significant increase in time (Spearman R= 0.34, p= 0.002), a trend also observed to the functional trait Phytophagous/Phyllophagous (biters and sap suckers) (Spearman R= 0.27, p= 0.047), and to Hemiptera (Spearman R= 0.58, p= 0.036). Twenty-two of the total alien species are invasive (2%). Most of them were intentionally introduced or escaped from confinement, and belong to other trait categories such as "Omnivorous". Our conclusion is that acting on Pathways is an important way for controlling the richness and filtering the bulk of alien species, and preventing the introduction of species within certain functional traits. But, this action is not necessarily effective for filtering invasive species.

Session:5 – Conservation Issues and Biological Invasions

A FOUR-DECADE FOLLOW-UP OF THE NATIVE FISH COMMUNITIES AND ALIEN INVASIONS IN THE LOWER TAGUS RIVER

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For the first time, we assessed the long-term spatiotemporal changes in fish assemblages along the lower Tagus River. A 140 km long river stretch has been monitored annually with fish sampling at 12 equidistant monitoring stations since 2016. We complemented this data with literature spanning 40 years, dating back to before the introduction of most alien fish species in this river. Fish sampling data obtained by different fishing methods was treated as catch-per-unit effort (CPUE) and combined by Multigear Mean Standardization. Four decades of data have confirmed the presence of 32 species, fewer than two thirds of which are native. The data also revealed a 40% decrease in the proportion of native species, equating to an average annual decline of 1%. This rate of change was constant throughout the monitoring period, representing a significant modification of the fish assemblages and biocenosis structure. The fish assemblages changed from heterogeneous assemblages with equitable guilds to homogeneous biocenoses dominated by piscivorous and planktivorous water column feeder species with limnophilic and tolerant traits, attributed primarily to the replacement of native by alien species. Furthermore, the native species have experienced a reduction in their distribution range with about 25% being currently threatened according to the Portuguese Red Book of Freshwater and Diadromous Fishes. The distribution ranges also reveal a critical 32 km stretch of the river between Constância and Porto da Courela, where rare endangered species and high biodiversity mark this area as a priority for conservation actions. These factors have led to ecological degradation of the Lower Tagus River, as indicated by a low rating on the employed biotic integrity index, which shows a decreasing trend over time. If the current trend continues, fish assemblages will undergo further changes and the risk of native species extinction must be urgently addressed.

Session 6 – Pathways and dispersal of invasive species

INVASIVE SPECIES DISPERSAL ON FLOATING PLASTICS IN THE SOUTHEAST PACIFIC: A COMPREHENSIVE 3-YEAR STUDY OF RAFTING IN A TEMPERATE MARINE CURRENT SYSTEM

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Rafting on anthropogenic marine debris (AMD) is believed to have a significant impact on the dispersal of non-indigenous species (NIS). Current knowledge is based on isolated observations and few dedicated studies. To understand rafting patterns and potential impacts in large oceanic systems, comprehensive studies covering longer distances and time periods, with a diverse methodological approach, are necessary. Here, we present a three-year study of AMD-driven NIS dispersal in the Southeast
Pacific, from remote Rapa Nui (Easter Island) to the Chilean continental coast (27° to 41°N). We quantified arrival frequencies of AMD and attached biota through daily beach samplings. Settlement plates in high-risk locations detected additional NIS with the potential for AMD-driven dispersal. Consumptive biotic resistance (= predation pressure) was quantified and compared between water depth zones in each study region, based on in-situ squidpop experiments.
Total AMD accumulation rates did not follow a recognizable geographic pattern. In contrast, accumulation frequencies of items with a pelagic trajectory (as indicated by the presence of pelagic epibionts) were much higher on Rapa Nui in the South Pacific Subtropical Gyre's center region than along the Chilean continental coast. Minimum floating times of litter items (as estimated from the size of pelagic epibionts) followed a clear current-related pattern, being highest on oceanic Rapa Nui and declining along the Chilean continental coast towards lower latitudes. Several new NIS records and range extensions were detected, including the finding of Watersipora spp. on Rapa Nui and in continental Chile. Predation pressure was defined by vertical water zonation, with significant bait consumption being limited to the seafloor.
The comprehensive assessment revealed a high risk of AMD-driven NIS dispersal in the temperate SE-Pacific, where pelagic predation pressure is largely absent. Regular monitoring and cleaning of high-risk sites could help to detect invasions in early stages and to limit their spread.

Session 5 – Conservation issues and biological invasions

HOST-RELATED TRAITS INFLUENCE THE MICROBIAL DIVERSITY OF THE INVASIVE SIGNAL CRAYFISH

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The microbiome influences a variety of host-environment interactions, and there is mounting evidence of its significant role in biological invasions. Invasion process may lead to changes in host's microbiome composition and dynamics due to both changes in extrinsic (environmental) and intrinsic (host-related) factors. Since microbes affect the host's physiology, immune status, health and fitness, these processes may significantly affect invasion success by either impeding or facilitating further spread and impact of an invader. The signal crayfish (*Pacifastacus leniusculus*) is one of the most successful crayfish invaders in Europe, often displaying differences in traits such as sex composition, size structure, and aggressiveness along its invasion range. We used 16S rRNA gene amplicon sequencing to examine the effects of host-related traits, namely total length (TL), body condition index (FCF), hepatosomatic index (HSI) and sex on the microbial diversity of the signal crayfish. We examined both external (exoskeletal) and internal (intestinal, hepatopancreatic, hemolymph) microbiomes of 110 signal crayfish individuals from four sites along its invasion range in the Korana River, Croatia. While sex did not exhibit a significant effect on the microbial diversity in any of the examined tissues, exoskeletal, intestinal and hemolymph microbial diversity significantly decreased with increasing crayfish size. Additionally, significant effects of signal crayfish condition (FCF, HSI) on microbial diversity were recorded in the hepatopancreas, a main energy storage organ in crayfish that supports reproduction and growth and also regulates immune response. Our findings provide a baseline for evaluating the contribution of microbiome to an invader's overall health, fitness and subsequent invasion success.

Session 3 – Global change and invasions

RIVER WARMING AND PREDATION PRESSURE OUT-TURN ON GROWTH AND SURVIVAL OF NATIVE AND ALIEN FRESHWATER GAMMARID SPECIES

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Elevated and unstable daily water temperatures combined with predator pressure affect many biological processes. A key group that is currently enormously affected is amphipod crustaceans (Amphipoda: Gammaroidea). Amphipods play a vital role in aquatic ecosystems due to their contribution to break down of coarse particulate organic matter and being a primary prey for fish. We used two amphipod species, native European *Gammarus jazdzewskii* and alien Ponto-Caspian *Pontogammarus robustoides* to elucidate how rising temperature and predator pressure interact to affect amphipods. We tested them in 4 different treatments: stable thermal conditions (17, 20, 23°C) and fluctuating thermal conditions (between 17 and 23°C) in the presence or absence of perch kairomones for 14 days. We measured food consumption, growth and survival of amphipods. Both species showed different tolerance to raised temperature and anti-predator strategies. Survival of the native species was lower at 23 versus 17°C, while survival of the invasive species did not differ between temperatures. At 17°C, the presence of predator kairomones reduced survival of the native species but increased that of the invader. Growth of *G. jazdzewskii* did not differ between temperature and predation risk treatments, while in the case of *P. robustoides* it was negatively correlated with amphipod size and perch kairomones. Leaf consumption by the native species was significantly lower at 17°C compared to the other temperatures, while the invasive species showed the highest consumption at 23°C. The invasive species, showing higher survival in the predator presence and higher thermal tolerance, may thrive in a changed environment, whereas the native species may face lower survival in a warming environment, especially when predation pressure is high. This is likely to lead to the further expansion of the invader and potential species displacements in temperate freshwater amphipod communities.
Our research was supported by the National Science Center, Poland grant No. 2020/39/D/NZ8/01226.

Session 5 – Conservation issues and biological invasions

TRAVELLING RIVERSIDE BLUES: LONG-DISTANCE MIGRATION OF THE INVASIVE ATLANTIC BLUE CRAB

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The Atlantic blue crab (*Callinectes sapidus*) has invaded coasts and estuaries across the Western Palearctic, causing severe ecological and socioeconomic impacts. The life cycle of the blue crab often involves migratory movements between marine waters, estuaries and upstream freshwater environments. While upstream migration of the blue crab is well known in its native range, it has been very sparsely analysed in invaded areas.

We report long-distance migration events in the Iberian Peninsula and use a global database to assess the probability of blue crab occurrence in relation to distance from the sea. We exemplify the potential impacts of the blue crab on fresh waters by overlapping its probability of occurrence with that of the critically endangered European eel (*Anguilla anguilla*). Finally, we evaluate the blocking effect of dam barriers on the upstream spread of the invasion.

Invasive blue crab populations have been detected at 108 km from the sea in the Guadalquivir River (the farthest distance reported outside its native range), at 71 km in the Guadiana River, and at 53 km in the Ebro River. Although the probability of blue crab occurrence decreases steeply in the first few upstream kilometers, it remains concerning within a dozen kilometers from the river mouth. The invasive potential of the blue crab significantly overlaps (63%) with the Iberian range of the European eel. The effect of dams on the potential invasion of freshwater systems was limited (13%).

The migratory behaviour of the blue crab poses a new threat to freshwater species, particularly to those inhabiting coastal streams and to migratory species artificially restricted to coastal areas by the blocking effects of barriers. Our findings highlight the need to expand our understanding of the impacts of this invasion on inland waters.

Session 1 – Risk assessment and management of invasive species

DEALING WITH UNCERTAINTY AND CONFLICTING OBJECTIVES IN THE CONTROL OF INVASIVE ALIEN SPECIES

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Invasive alien species (IAS) are a major cause of biodiversity loss, impacting endemic species via predation, competition for resources, and more. There are numerous approaches to control IAS, but their success varies depending on the target species and management context. A formal evaluation of different methods is needed when dealing with limited resources and ethical implications of lethal and non-lethal control methods.

This study focused on control methods for *Trachemys scripta*, one of the 100 most invasive species according to the IUCN. The presence of *T. scripta* can have negative ecological impacts to native European pond habitats, particularly through competition with the European pond turtle (*Emys orbicularis*).

Our project assessed methods for *T. scripta* control, in terms of biological effectiveness and costs. For effectiveness, we projected *T. scripta* population dynamics under different control methods. For this we used data from literature, previous projects, and novel data through an ongoing collaboration with our partners at the LIFE URCA PROEMYS project. Using the modelling results, we estimated the total management costs. I will present these results (finding fyke traps to be the most cost-effective) and propose our methods to answer further questions such as animal welfare and dispersal.

Through this assessment, we facilitate rational planning, balancing successful control actions and financial constraints against biological evidence, allowing optimal protection of native species.

Session 2 – New tools and approaches for detection and monitoring

LAGGING BEHIND – WHAT DO WE KNOW ABOUT THE PARASITIC FAUNA OF ALIEN FISHES IN THE MEDITERRANEAN?

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The Levant Basin is in many ways the world's most invaded marine ecosystem owing to the opening of the Suez Canal. The invasion of free-living organisms through this pathway is increasingly documented and monitored in the past two decades, and their ecological impact recognized. Bony fishes are amongst the major taxa introduced through the canal, comprising ~ 20% of the records. Nonetheless, while tremendous scientific effort is invested in documenting introduced fishes, their parasitic fauna, which naturally has an essential role in regulating host populations, has drawn relatively little interest. Here, we review the accumulating knowledge available fifty years after the first parasitological study of alien fishes in the Mediterranean Sea was published, and focus on co-introduction events and the recommended methods to study them.
Among the ~100 alien fishes of Indo-Pacific origin reported from the Mediterranean Sea, only 22 species have been examined for their parasites. Forty-two parasite species were co-introduced with their host, 20 were acquired locally, and the geographic origin of nine parasites could not be determined. Co-introduced parasites belonged to various taxonomic groups with either direct (single-host) or complex (multiple-host) life cycles. In our research, we examined the gill parasites (Monogenea) on the long-established invasive Spanish mackerel *Scomberomorus commerson*. The gills of *S. commerson* supported numerous, relatively large monogeneans, with prevalence levels up to 100% and high parasite load. Using an integrated molecular and morphological approach, we identified four co-introduced monogenean species. Examining fish specimens which originated from museum collections, we managed to backdate these parasites' first appearance in the Mediterranean. This study underlines the knowledge gap in parasitology of alien fishes in the Mediterranean, and the importance of evaluating parasite occurrence in future assessments of marine bioinvasions, particularly in view of the continued increased invasion through the Suez Canal.

Session 6 – Pathways and dispersal of invasive species

PLANT NATURALIZATION IS PROMOTED BY ABIOTIC AND BIOTIC SIMILARITIES BUT ALSO BY DISSIMILARITIES IN EVOLUTIONARY AND ANTHROPOGENIC HISTORIES BETWEEN THE NATIVE AND NON-NATIVE RANGES

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Understanding why alien species naturalize successfully in some regions but fail in others is crucial for ecology and conservation biology. Examining the similarities and dissimilarities between native and non-native ranges might provide important insights in drivers of naturalization. However, whether species are more likely to naturalize in environments similar or dissimilar to their native range remains unknown at the global scale. In this study, using the native and naturalized distributions of 11,604 naturalized alien plant species across 650 regions around the world, we assessed the impact of different aspects of ecological dissimilarities between native and non-native ranges on naturalization probability. The results show that naturalized species were more likely to naturalize in regions with higher climatic (i.e., temperature, precipitation), compositional and phylogenetic similarities to their native range. This suggests that pre-adaptation to the climatic and biotic conditions facilitates species naturalization. Moreover, we found that directional dissimilarities between native and non-native range also contributed to naturalization outcomes, particularly in contexts where both share comparable climates. Specifically, species from regions with high diversity and low human disturbance have higher naturalization success in less diverse, more human-disturbed regions. In conclusion, our study highlights the importance of considering not only climatic similarity between native and non-native ranges but also their directional dissimilarities in evolutionary and anthropogenic histories when exploring and predicting the future distribution patterns of naturalized species.

Session 2 – New tools and approaches for detection and monitoring

USING LONG-TERM BIOMONITORING DATA IN INVASION SCIENCE: THE CASE OF RIVERINE MACROINVERTEBRATE COMMUNITIES' INVASIBILITY

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Despite the acknowledged significance of long-term data in various scientific fields, its potential remains underexploited in invasion science, particularly in the context of invertebrates and freshwater ecosystems. Here, biomonitoring data can help depict invasion trajectories, species preferences as well as test ecological theories.
Understanding what makes a river system prone to invasion is of considerable interest to environmental regulators, resource managers, scientists and wider society globally. The use of long-term distributional data for *Dikerogammarus haemobaphes* (2009–2020) from England provided a unique opportunity to study faunal community patterns and differences between sites that experienced invasion compared to those that have not. Here we specifically aim (a) to identify specific biotic and abiotic conditions that make riverine ecosystems susceptible to Dh invasion; and (b) to explore some of the most popular hypotheses associated with biological invasions on riverine communities.
Sites that would later experience invasion by *D. haemobaphes* were characterized by higher abundances of other invaders (e.g., especially Ponto Caspian taxa), lower abundances of crustaceans and typically had greater channel width and water depth. These basic characteristics may help identify sites at risk of future invasion by *D. haemobaphes*. Most biomonitoring tools displayed no difference between control and pre-invaded samples, while both taxonomic and functional richness displayed higher values at sites that were subsequently invaded, questioning some biological invasion hypotheses. Recognizing specific community characteristics that may be a precondition for subsequent invasion is essential for understanding and better predicting their future trajectories of change.

Session 1 – Risk assessment and management of invasive species

USE OF THE RUST FUNGUS *PUCCINIA KOMAROVII* VAR. *GLANDULIFERAE* FOR THE MANAGEMENT OF IMPATIENS GLANDULIFERA IN THE UK

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Impatiens glandulifera or Himalayan balsam, is an annual weed that forms dense monocultures and negatively affects biodiversity in riparian and damp woodlands. Originally introduced by Victorian plant hunters to Europe as an ornamental plant from the foothills of the Western Himalayas, the plant is now found widely across the globe. Since 2006, CABI have been investigating the use of the rust fungus *Puccinia komarovii* var. *glanduliferae* as a classical biological control agent, originally collected from the Indian Himalayas. This highly specific rust fungus completes its whole life-cycle on Himalayan balsam and can cause significant damage to both young seedlings and mature plants. Following approval to release in the wild in 2014 and with support from local conservation groups, two strains of the rust have been released at field sites across England, Wales and Scotland. While there have been issues regarding plant susceptibility, the rust has successfully established and persists at a number of sites. Plants are tested to ensure they are fully susceptible to the rust before a new release and additional rust strains are being sought from the native range to tackle rust resistant populations. Field results are promising and show that the use of the rust fungus is safe and viable for the long-term management of Himalayan balsam; the rust is adapting to local climatic conditions, overwintering, completing its life-cycle and spreading within sites.

Session 1 – Risk assessment and management of invasive species

INVASIVE *CRYPTOTERMES BREVIS*: A GROWING CONCERN FOR WOODEN STRUCTURES IN PORTUGAL

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Cryptotermes brevis, an invasive drywood termite, is a voracious pest of wood-in-service. These termites establish nests and consume wood from within, facilitating their transport due to the small size of their colonies.
In Portugal, this invasive pest was first detected in Madeira Island and the Azores. It has also been found in Lisbon more recently (2010). When this species is spotted in new areas, it likely indicates invasive events occurred 8 to 10 years prior, owing to the cryptic habits of these termites.
Since its discovery in Lisbon, no systematic studies have been conducted to assess its distribution extent nor the implications of its presence in a city where a significant amount of wood is used in construction. Every year, new occurrences are added to the map, evaluation of infestations and the development of an integrated control strategy is needed.
Drawing from predictions made for Azorean cities, which indicated that delaying control measures would incur significantly higher costs compared to a "wait and see" approach, urgency exists in investigating the scale and severity of infestation in Lisbon. Concurrently, creating an effective communication and risk assessment plan, leveraging insights from past experiences in the Azores with the same invasive species, is imperative.
The engagement of society, policymakers, and experts in *C. brevis* biology and control is crucial for achieving success in integrated pest control in urban areas. The goal is to mitigate the impacts of this termite's infestation. Moreover, the unknown potential spread or invasion of *C. brevis* to other locations in mainland Portugal is a cause for concern, highlighting the necessity for occurrence data monitoring and modelling efforts considering the invasive species' ability to spread and establish itself.

Session 1 – Risk assessment and management of invasive species

BRIDGE FROM OBSERVATION TO ACTION: CRAFTING EFFECTIVE MANAGEMENT FRAMEWORKS - LESSONS FROM THE LIFE RIPARIAS PROJECT

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Biological invasions pose a pressing challenge to authorities responsible for biodiversity conservation, necessitating strategic and coordinated management efforts. Yet, creating effective management frameworks remains elusive. In this presentation, we explore insights gleaned from the LIFE RIPARIAS project, shedding light on challenges associated with crafting management strategies.

Life RIPARIAS endeavours to pioneer an evidence-based approach to decision making on IAS management. Through its inclusive and data-driven approach, it enhanced early warning and surveillance data flow to inform management. By promoting interoperability, training hundreds of stakeholders and bolstering surveillance, observations have quadrupled over three years.

Actions are prioritised through guidelines and objective criteria using a dedicated decision support system. They range from early detection and rapid eradication of emerging species to tailored approaches based on species distribution. These targeted interventions are identified, discussed with stakeholders and operationalised through river-basin-wide strategies validated by political authorities. Currently, 53 high priority sites are under management.

The project also places a premium on monitoring and efficacy of management actions, fostering accountability and improvement in management practices. It aims to catalyse knowledge exchange and replication of its evidence-based framework across Europe. By promoting collaboration and sharing best practices, it contributes to the broader implementation of the EU IAS Regulation.

With a six-years runtime and benefiting from co-funding provided by the LIFE program of the European Union and three Belgian regional authorities, LIFE RIPARIAS offers a blueprint for crafting effective and coherent management frameworks, particularly within administratively complex contexts, while actively engaging a diverse array of stakeholders.

Session 6 – Pathways and dispersal of invasive species

MODELING AND PREDICTING THE DISTRIBUTION AND IMPACT OF THE HIGHLY INVASIVE FRESHWATER JELLYFISH *CRASPEDACUSTA SOWERBII* IN THE CATCHMENT OF LAKE KINNERET

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The *Craspedacusta sowerbii* jellyfish is probably one of the most efficient invasive species in freshwaters. The presence of swarms of these species can potentially have strong negative effects on the limnologic ecosystem and especially on fish production. The species was reported in 2011 in a single pond within a tributary of Lake Kinneret - the most important freshwater ecosystem in Israel. However, the species' recent distribution was unknown until 2023 when a German-Israeli team sampled major tributaries in the Golan Heights region. The analyses showed a striking pattern of dense jellyfish (polyp) populations in tributaries. Even more surprising is the finding of a strict spatial separation of two distinct genotypes of the jellyfish (characterized by different sexes and ecological traits) within a single tributary and along very short spatial scales. Furthermore, limnologic fluid dynamic model simulations demonstrate that the jellyfish can reach Lake Kinneret from these tributaries, via rivers flowing from the Golan Heights. Those simulations are in the process to implement a state of the art active-matter model of the dynamics of jellyfish swarms. Preliminary results indicate that *C. sowerbii* may indeed form dense localized 'hotspot' swarms of potential damage on the Lake Kinneret ecosystem. Beyond the aforementioned regional importance, this case study provides understanding of short scale dispersal dynamics of invasive species with complex life cycles.

Session 3 – Global change and invasions

GLOBAL IMPACTS TO NATURE, NATURE'S CONTRIBUTIONS TO PEOPLE AND GOOD QUALITY OF LIFE FROM THE IPBES ASSESSMENT ON INVASIVE ALIEN SPECIES

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More than 37,000 established alien species from all taxonomic groups have been introduced by human activities across all regions and biomes of Earth, with new alien species presently being recorded at an unprecedented rate of approximately 200 annually. Here, we report on the first systematic global assessment by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) of the impacts of invasive alien species on nature, nature's contributions to people, and good quality of life (Bacher et al. 2023: https://doi.org/10.5281/zenodo.7430731). Studies with evidence of negative impacts exist for more than 3,500 alien species, which are categorized as invasive. The magnitude and types of impacts vary for different invasive alien species and across ecosystems and regions. For example, invasive alien species have contributed solely or alongside other drivers to 60 percent of recorded global extinctions and are the only driver in 16 percent of the documented global animal and plant extinctions. Two hundred eighteen invasive alien species have caused 1,215 local extinctions of native species. The economic cost of biological invasions has increased fourfold every decade over the last 50 years. The vast majority of global costs (92%) accrue from the negative impacts of invasive alien species on nature's contributions to people or on good quality of life, while only 8% is related to management expenditures of biological invasions. Invasive alien species deteriorate human well-being in 85% of all observed impacts on good quality of life. The documented benefits to people that some invasive alien species provide are generally much smaller than the negative impacts and do not mitigate or undo the latter.

Session 6 – Pathways and dispersal of invasive species

FROM DOWN UNDER TO ALL OVER THE EUROPE – FIRST CENTURY OF DEVIL'S FINGERS (*CLATHRUS ARCHERI*), AN ALIEN FUNGUS PRESENCE ON THE CONTINENT

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Devil's fingers (*Clathrus archeri* (Berk.) Dring) is a saprobic fungus native to Australia and New Zealand. Nowadays, it is present worldwide, with Europe being most inhabited. It is believed that the fungus came to Europe at the beginning of 20th century as an unintentional introduction, most probably by sheep's wool import from Australia and/or New Zealand. From France it spread gradually across Europe, with currently recorded observations in the majority of European countries. Its expansion rate corresponds roughly to 15 kilometers per year. And while expansion rate was similar throughout its' century of presence in Europe, the number of observations dramatically increased in the last 15 years (over 80% of all data out of over 6000 observations). Latter could be the result of: increased awareness of its existence; usage of biodiversity data depositing services/platforms like GBIF and iNaturalist; fungus population increase. While fungus seems not to be very picky on habitats (different type of forests, semi-open and open habitats), it prefers acid soil with 50% of localities (interquartile range) having pH values in range 5.3 – 5.9, while 80% (10 to 90 percentiles) in range 5.1 – 6.3. Although some observations are on high elevations (maximum 2134 m.a.s.l.), interquartile range is 120 – 430, and 10-90 percentiles range is 50 – 650 m.a.s.l. Statistically significant negative correlations were found between elevation and geographical latitude, and positive with longitude. At the continent level, fungus was observed (via presence of their short-lived sporocarp) almost all year round, with most of the data originating from autumn with peak in October. Fruiting occurs later towards the northern and eastern part of the fungus' distribution. However, it seems that in south-south-western parts of its distribution there are two fruiting events, in spring and in autumn. Currently we lack information on its potential negative impacts and should pay more attention to this in the future.

Session 1 – Risk assessment and management of invasive species

THREE-YEAR SURVEY OF NATIVE AND INVASIVE SMALL MAMMAL COMMUNITIES IN THE AUTONOMOUS PORT OF COTONOU, BENIN: COMMUNITY ECOLOGY, POPULATION GENETICS AND PATHOGEN DETECTION

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Sea trade plays a crucial role in the unintentional introduction and long-distance spread of organisms likely to proliferate far from their original distribution areas. The Autonomous Port of Cotonou (APC, Benin) is particularly affected by the successful invasion of exotic rodent species and their pathogenic burden, to such an extent that International Health Regulations from the World Organization have been implemented over the last decade. Using data from a longitudinal three-year survey within the APC, we aim to (i) describe rodent diversity and their spatio-temporal distribution, (ii) analyze the genetic structure of invasive rodent populations and (iii) identify zoonotic pathogens (Hantavirus, Vibrio, Leptospira, Trypanosoma) borne by both native and invasive rodents.

Six trapping sessions were carried out between September 2017 and March 2020 at nine sites within the port's industrial and artisanal zones. They enabled the identification of two native species (*Mastomys natalensis* and *Crocidura olivieri*) and three invasive species (*Rattus rattus*, *R. norvegicus* and *Mus musculus*), which are abundant, and for which distribution is stable over time and spatially structured. Species-specific microsatellite panels showed highly marked genetic structure for populations belonging to the three invasive species, and no signal for new introductions over the three years of our monitoring. Finally, serological and molecular tools revealed that several – potentially zoonotic and highly deleterious – pathogens (Seoul virus, Leptospira, Trypanosoma) circulate within small mammal populations from the APC, some of which being recently introduced.

Our work has led to operational recommendations made to the APC authorities in terms of both control of small mammal populations and prevention of associated zoonotic risks. In particular, we suggested that the control methods (chemical and mechanical) usually employed should be accompanied by environmental management measures (ecologically-based rodent management) and systematic preventive actions (rat guards along mooring lines).

Session 1 – Risk assessment and management of invasive species

PHENOLOGICAL MISMATCHES MITIGATE THE ECOLOGICAL IMPACT OF A BIOLOGICAL INVADER ON AMPHIBIAN COMMUNITIES

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Horizon scans have emerged as a valuable tool to anticipate incoming invasive alien species (IAS) by gauging species on their potential impacts. However, little research has been conducted on quantifying actual impacts and assessing causes of species-specific vulnerabilities to particular IAS due to methodological challenges. The underlying mechanisms driving species-specific vulnerabilities therefore remain poorly understood, even though they can improve the accuracy of risk assessments. Given that interspecific interactions underlying ecological impacts of IAS are shaped by phenological synchrony, we examined whether temporal mismatches in breeding phenology between native and invasive alien species can mitigate ecological impacts. Focusing on the invasive American bullfrog, we combined an environmental (eDNA) quantitative barcoding and metabarcoding survey in Belgium with a global meta-analysis, and integrated citizen-science data on breeding phenology. We examined whether the presence of native amphibian species was negatively related to the presence or abundance of invasive bullfrogs, and whether this relationship was affected by their phenological mismatches. The field study revealed a significant negative effect of increasing bullfrog eDNA concentrations on native amphibian community structure. These observations were shaped by species-specific vulnerabilities to invasive bullfrogs, with late-breeding species being strongly affected, while early-breeding species remained unaffected. This trend was confirmed by the meta-analysis. A significant negative relationship was observed between phenological mismatch and the impact of bullfrogs. Taken together, we present a novel method based on eDNA quantitative barcoding and metabarcoding to quantify the ecological impacts of biological invaders. We show that phenological mismatches between native and invasive species can be a strong predictor of invasion impact. Therefore, we advocate for the integration of temporal alignment between native and invasive alien species' phenologies into invasion impact frameworks.

Session 2 – New tools and approaches for detection and monitoring

LET´S TALK ALIENS– INVOLVING STAKEHOLDERS IN INVASION SCIENCE

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Addressing the multi-layered and often context dependent issue of biological invasions requires large amounts of information to develop adequate approaches. However, data availability is often limited where resources dedicated to the monitoring and management of alien species remain insufficient. In these cases, stakeholder knowledge can represent a valuable contributing source of information. In two case studies we utilize stakeholder knowledge to address questions regarding European flounder in Iceland, an alien species that was first officially recorded in Icelandic waters in 1999. Genetic analysis has revealed that European flounder in Iceland most likely originated from the Faroe Islands. However, uncertainty around anthropogenic involvement in the introduction pathway remains, with potential implications on the species´ classification. In the first study, we used online surveys to explore how invasion scientists would classify European flounder based on the current knowledge as well as whether the underlying cause of introduction matters to stakeholders in Iceland. Results highlight the difficulties of defining the status of an understudied species in invasion science and further showcase that to stakeholders, perceived negative impacts of a species are more important than how it arrived. In a second study, we explored stakeholder knowledge as a low-cost additional tool for monitoring the presence of alien species in data-poor regions such as Iceland. In 2019 we administered an online survey asking the recreational fishing community in Iceland to provide locations where they have encountered European flounder. We then compared the resulting locations to the distribution data that has been collected by the Icelandic Marine and Freshwater Research Institute (MFRI). This comparison not only highlights the low amount of location data for European flounder collected in scientific surveys, but it also further indicates that by including stakeholder knowledge, we are able to recreate the species´ spread in much more detail.

Session 2 – New tools and approaches for detection and monitoring

INTEGRATING HABITAT MODELS AND MONITORING FOR SUN CORAL CONTROL IN A MARINE PROTECTED AREA IN SOUTHERN BRAZIL

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In Brazil, two species of Tubastraea were introduced through biofouling on oil platforms/drilling ships in the late 1980s. Currently, they are found on structures associated with the oil industry, rocky shores, and reefs along the Brazilian coast. The sun coral (SC; T. coccinea) was first detected at Arvoredo Marine Biological Reserve (REBIO Arvoredo) in 2012, southern limit of the invasion in Brazil. Due to the dispersal speed, strategies are needed to prioritise areas for management and monitoring. In this sense, the objective of this work is to rank localities at REBIO Arvoredo and its surroundings (REBIO-S) based on monitoring indicators and habitat suitability modelling. Thirty-seven rocky reef localities at REBIO-S were monitored, through autonomous diving and snorkelling in the depth range between 1.5 m and 20 m. The relative abundance of SC was sampled using the DAFOR protocol adapted for SC occurrences, where each minute along the shoreline a class of sun coral relative abundance is assigned. We used habitat suitability modelling to classify the most suitable areas for SC occurrence, using predictors of environmental and anthropic origin. In the 37 sampled locations, sun coral was present in 12. Out of 4751 visual transects, sun coral was present in 69 (1.45%). The best suitability model was composed by bathymetry and distance from the first invasion spots in the region. The model indicates a high probability of occurrence within a radius of approximately 8 km from the original invasion points. With those results we propose an index to rank locations to be monitored and managed based on: distance from the original invasion points, detection effort (n. detections/h), and days since the last check. This locality ranking could help the managers of the conservation unit to optimize resources and efforts in combating the invasion of SC.

Session 5 – Conservation issues and biological invasions

ABUNDANCE DISTRIBUTIONS OF INVASIVE AND NON-INVASIVE TERRESTRIAL PLANT SPECIES

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Invasive species are often thought to be 'common' (widespread and abundant) in their introduced ranges. Common species have larger ecological impacts and are a greater concern for invasive species management. However, comparisons of the regional abundance of invasive versus non-invasive species are rare, leading to an unanswered question: does 'commonness' drive invasive species impacts or are impacts caused by other mechanisms? Here, we used over 1.5 million observations of native and introduced plant abundance (in the form of percent cover) across the contiguous United States to ask whether invasive plants are more often abundant than non-invasive plants. We used existing datasets to identify invasive, introduced (non-native but not invasive), and native species in the contiguous United States. We used empirical cumulative distribution functions (ECDFs) to compare the abundance distributions of the three groups and also analyzed differences across ecoregions and growth habit. We used this information to categorize abundance records of 11,000 terrestrial plants (invasive = 388 spp.; introduced = 735 spp.; native = 10,188 spp.). Invasive plants had significantly higher abundance (mean = 10%) than native plants (mean = 6%) or introduced plants (mean = 5%). These groups also had significantly different empirical cumulative distribution functions (ECDFs), further showing that invasive plants are consistently more abundant than native or introduced plants. Invasive species were both less present at trace values/low abundance and more likely to be observed at high abundance than non-invasives. This pattern was even more pronounced when the data were analyzed at the ecoregional rather than the national scale. These results demonstrate that abundance is a meaningful piece of invasive impacts, and controlling abundance is likely necessary to mitigate impacts.

Session 1 – Risk assessment and management of invasive species

ALIEN PLANTS ON THE NOT SO DISTANT HORIZON: A RISK SCREENING OF POTENTIALLY INVASIVE PLANT SPECIES IN EUROPEAN-ATLANTIC COASTAL DUNE HABITATS

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Invasive alien species (IAS) are a critical issue for Atlantic coastal dune conservation, fueled by urban plantings, garden escapes, and spread from existing populations. This degradation compromises habitat quality and conservation status. Early detection and management are essential, requiring prioritization and identification of horizon scan species for prompt removal. Within the LIFE DUNIAS (DUNe restoration by tackling Invasive Alien Species) project in Belgium, a risk screening was conducted covering the Atlantic coastal zone in Europe from Portugal up to Denmark and including the UK and Ireland. It used a combination of available scientific evidence and a moderated process to capture expert knowledge. This approach, unlike previous scans, considered plants and bryophytes with records in the area, encompassing potential sleeper weeds as well as established high-impact IAS. It evaluates the impact specifically on protected Annex I habitats under the NATURA2000 regime such as tidal salt marshes, embryonic dunes, cliffs, mobile sand dunes, dune grasslands, dune scrub and woodland. Utilizing a repeatable, data driven workflow that combines GRIIS checklists of the different countries with occurrence data from GBIF, over 1,300 aliens were identified and narrowed down to 250 through expert evaluation. These underwent detailed assessment for their introduction, establishment, spread, and ecological impact through moderated expert workshops. The resulting risk scores were combined with distribution data to identify emerging, high-impact invaders. Horizon scan lists were developed for different countries, highlighting potential invaders not yet established. This black list of IAS represents a crucial step in the Atlantic dune conservation roadmap. The workflow can be adapted for similar risk screenings in other habitat ecoseries such as grasslands, forests, heathlands and wetlands. Such lists inform conservation status assessments and harmonize approaches across legal regimes like NATURA2000, the Water Framework Directive, and the EU IAS Regulation.

Session 3 – Global change and invasions

THE SHRUBIFICATION OF THE ANTARCTIC: INCREASES IN INVASIVE WOODY PLANT SPECIES UNDER CLIMATE CHANGE ON ISLANDS IN THE SOUTHERN OCEAN

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The Antarctic region is among the remotest and most inhospitable in the world, and yet invasive species have managed to establish on even the coldest islands. Climate change has already lowered climatic barriers for some species, and is presumed to do so for many others coming the end of the century. In order to quantify how many new invasive species are projected to be able to persist under current (1981-2010) and future climatic conditions (2071-2100) in the (sub-)Antarctic, we ran species distribution models for all non-tropical plant species that are considered invasive anywhere on the globe. We thereby investigated three global climate models and two emission scenarios, representing mild and severe changes to the climate. We found that the climate of all of the 12 study islands in the Southern Ocean will become suitable for more alien species than they currently are predicted to support in case of the severe emission scenario (SSP1-RCP8.5). Similarly, for the mild emission scenario (SSP5-RCP2.6) all but the most-northern Amsterdam Island, are projected to be suitable for more alien plant species. Increases in alien species numbers are large, with more than half of the islands expecting an increase over 250% to the current predictions. Furthermore, whereas the flora of the islands currently consists of mostly herbaceous species, several (more) tree and shrub species could persist on the islands, if introduced. Our findings show that as climatic barriers weaken across the Antarctic region, and without appropriate biosecurity, that vegetation communities are likely to transform.

Session 5 – Conservation issues and biological invasions

A META-ANALYSIS OF TRAIT EVOLUTION IN INVASIVE PLANTS WITH TIME SINCE INTRODUCTION

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The success of invasive plants is often attributed to rapid post-introduction evolution, due to novel selection pressures at the introduced range. However, increasing number of studies suggest that evolutionary shifts in invasion-promoting traits can also take place within the introduced range over time. Here, we performed a meta-analysis aimed at providing a general overview of current knowledge on trait evolution with time since introduction. We predicted that invasion-promoting traits, including growth, competitive ability and dispersal ability, will decline in more established populations with a longer invasion history due to the attenuation of selection pressures, such as enemy release or interspecific competition, while herbivore defense will increase. Our results reveal a general indication for the evolution of invasive plants with residence time for most of the studied traits. However, this divergence did not have a consistent direction in most traits, except for growth, which, in contrast with our prediction, increased with residence time. The general temporal effect found in our meta-analysis stresses the need to consider population age when comparing attributes of invasive plants between native and invasive ranges. Moreover, the increased size of invasive plants in older populations suggests that the dominance of these plants might not attenuate with time since introduction, thus highlighting the need to further explore the long-term dynamics between invasive plants and their recipient native communities.

Session 1 – Risk assessment and management of invasive species

THE MANAGEMENT OF DESPAIR: TESTING A COMMON NON-RECOMMENDED METHOD FOR MITIGATION OF *VESPA VELUTINA* DAMAGE IN VINEYARDS

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The invasive hornet *Vespa velutina* is a species of high concern in the Iberian Peninsula, with reported impacts on economic activities such as beekeeping or fruit production. Currently available hornet management techniques in fruit production are limited or too expensive to be widely adopted, and small wine producers in areas of NW Spain have manifested their frustration in the face of the important damages suffered. They have relied on an unarranged use of liquid-baited devices for trapping founder queens of *V. velutina* in spring and *V. velutina* workers during the ripening season in summer, despite this method has been disapproved because of its low selectivity and potential impact on non-target insects. In this work we present the results of two trapping experiments designed to evaluate: 1) the effectivity of liquid-baited traps for the reduction of hornet damage in one white wine cultivar during the ripening season, and 2) the factors that influence the hornet captures, when used in vineyards of two wine producing areas, both in spring and summer. Results show that damage recorded in bunches of grapes does not depend on the density of traps installed. Also, as expected, the number of hornets captured depends on the season. However, we discuss also the influence of the wine producing area and even of the cultivar on the results, as damage by hornets recorded differed in our sites. Results suggest that trapping does not offer an effective protection method against *V. velutina* in vineyards, and factors such as the cultivar or the type of land cover in the area may modulate the impact of the species. We suggest wine growers should dismiss ineffective trapping in vineyards.

Session 5 – Conservation issues and biological invasions

THE THREAT OF INVASIVE ALIEN SPECIES ON THE THREATENED SPECIES OF THE FRENCH OVERSEAS TERRITORIES: AN ANALYSIS OF THE FRENCH NATIONAL IUCN RED LISTS

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Invasive alien species (IAS) are the primary threat to the biodiversity of island ecosystems. French overseas territories, mainly islands and home of unique part of national and global biodiversity, are facing the threat of biological invasions. National assessments of biodiversity threats help identify action priorities and support conservation policies and strategies. However, there is currently no documented evaluation of the impacts of IAS on threatened species in the French overseas territories. Since 2008, the IUCN French Committee has been compiling national Red Lists of threatened species and the threats they face. Thanks to these lists, species in French overseas territories threatened by biological invasions have been identified. The analysis reveals that 26% of threatened and near-threatened species are impacted by IAS, totaling 919 species, including 228 endemics. 149 IAS impacting threatened or near-threatened species have been documented, Rusa timorensis, Rattus rattus, Sus scrofa and Felis catus being the four IAS impacting the greatest number of native species. Regarding recorded species extinctions, 43% are linked to the consequences of biological invasions, totaling 101 species, including 96 endemics. 27 IAS have been identified as playing a confirmed or suspected role in these extinctions, notably Euglandina rosea, Rattus rattus, and Felis cattus. Analysis for each overseas territories have also been conducted. Based on these findings, several recommendations can be made : accelerate, intensify, and prioritize invasive alien species eradication programs to maximize biodiversity benefits; promote multi-species eradication programs; ensure the sustainability of operations and their long-term benefits; and encourage local community participation in ecological restoration projects aimed at rehabilitating ecosystems or populations of threatened species affected by IAS.

Session 1 – Risk assessment and management of invasive species

RHOPILEMA NOMADICA IN THE MEDITERRANEAN: WHERE FROM AND WHY NOW?

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Since it was first observed in Israel in the 1970s, *Rhopilema nomadica* has established a reputation as one of the worst invasive species in the Mediterranean Sea. It was assumed to originate in the Red Sea, or in the Indo-Pacific region, but in the absence of additional reports of live specimens outside the Mediterranean, its origins remained a mystery. Here, via molecular analysis, we present the first verified results of the existence of *R. nomadica* in the Western Indian Ocean. Moreover, using additional evidence from *Cassiopea andromeda* and *R. nomadica*, we propose that the construction of the Aswan High Dam may have led to the proliferation of *R. nomadica* in the Levantine Basin.

Session 6 – Pathways and dispersal of invasive species

EXPERIMENTAL EVALUATION OF HABITAT PREFERENCES OF INVASIVE CRAYFISH SPECIES IN EUROPE

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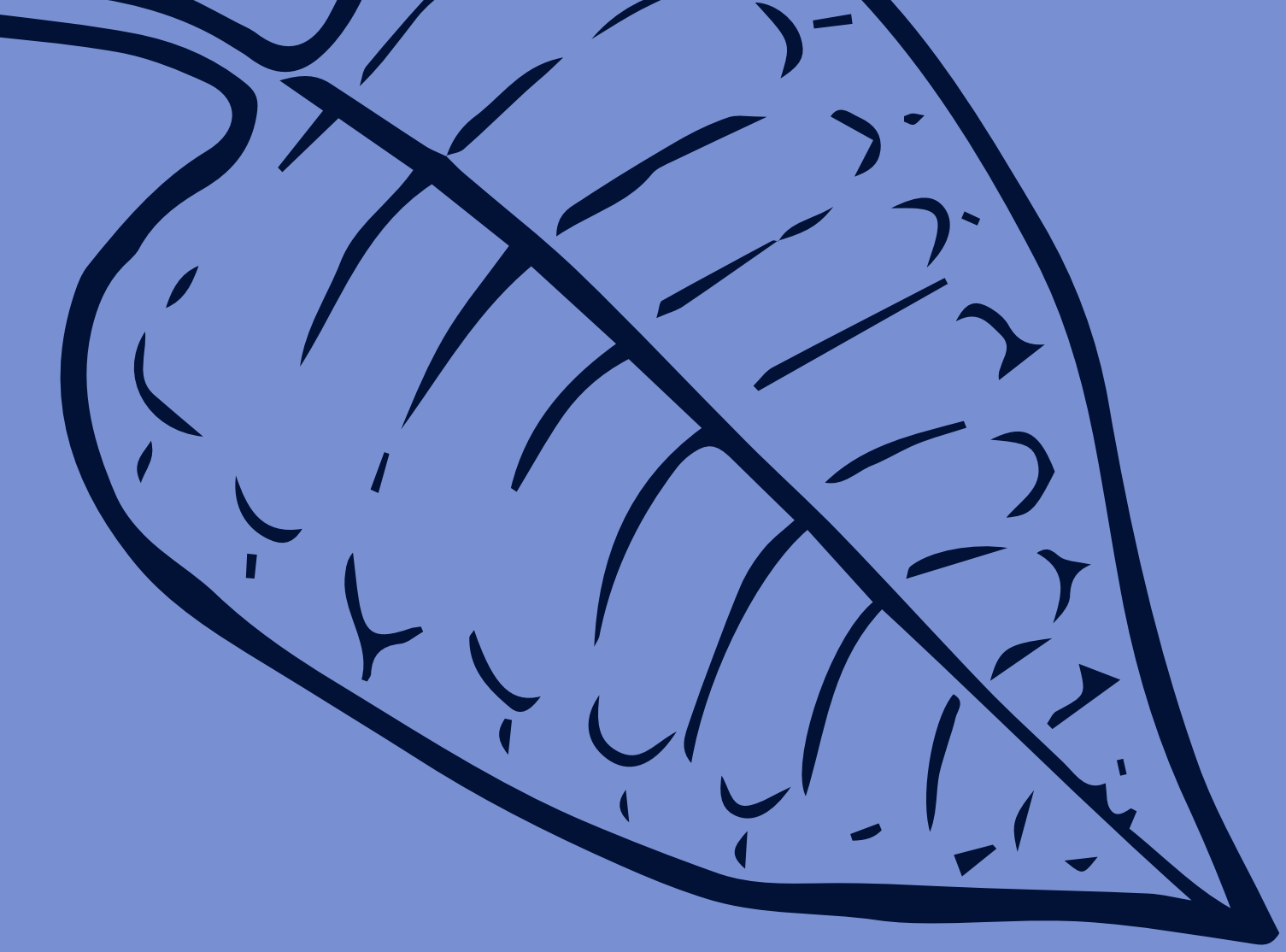
With global warming and expanding species distribution ranges, the amount of interactions between old and new invaders is bound to increase. Our research aims at determining differences in habitat preferences between North American crayfish species invasive in Europe: *Faxonius limosus*, that can be categorized as an old invader in Poland, and new invaders in Polish waters: parthenogenetic *Procambarus virginalis* and *Procambarus clarkii*. Our research shows differences between the species concerning such traits as shelter size, use of bivalve shells as shelters and different substratum grain size. All the species showed a preference for the substratum of similar grain size (around 2 mm in diameter) and avoided shelters made of shells of the invasive clam *Corbicula* sp. The old invader *F. limosus* turned out to be the most selective species in experiment, selecting the smallest available shelters (width of 5 cm, vs. 10-15 cm), preferring shells of invasive unionid mussel *Sinanodonta woodiana*, and avoiding shells of native unionid bivalves. *Procambarus virginalis* was the least selective species, with the widest grain size preference range (no discrimination within 2-5 mm), no clear affinity for particular shelter size and unionid shells of particular species. *Procambarus clarkii* was the most mobile and explorative species, having the lowest affinity towards the selected habitat, spending relatively more time outside the preferred area and spending less time in shelters. *Procambarus clarkii* preferred the largest shelters (15 cm in width) vs smaller ones (5-10 cm). Interactions between old and new invaders show possibility for habitat partitioning in environments with a high abundance of shelters of variable quality. We also point out the possible facilitation and inhibition of crayfish spread by the invasions of habitat-forming *S. woodiana* and *Corbicula* sp., respectively.



POSTER PRESENTATION ABSTRACTS

Session 1 – Risk assessment and management of invasive species

APHID INFESTATION ON INVASIVE *IMPATIENS* L. SPECIES IN EUROPE: IMPLICATIONS FOR PLANT-INSECT INTERACTIONS AND INVASION ECOLOGY

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The relationship between aphids and plants is of significant ecological importance, as aphids can directly and indirectly affect plant health and ecosystem dynamics.

The research covered five species of *Impatiens* found in Europe, four of which are of foreign origin: the highly invasive *I. glandulifera*, the moderately invasive *I. parviflora*, the locally invasive *I. capensis*, potentially invasive *I. edgeworthii* and one native species - *I. noli-tangere*.

Our research focused on three main questions: i) do invasive Impatiens species originating from different regions in their secondary range in Europe harbor the same aphid species as the native Impatiens? ii) if the level of aphid pressure on these species drives level of invasiveness of tested alien Impatiens species iii) if native *I. noli-tangere* exhibited lower pressure from the aphids than invasive species.

We analyzed aphids' diversity and species composition, collecting material from 58 populations from 12 European countries and Tajikistan. Localities where the species occurred independently were taken into account, as well as those where the species co-occurred. Aphids were collected from several shoots of each species and preserved in 96% alcohol. We identified the aphids through DNA barcoding (884 COI sequences) and obtained nine taxa with three dominant species: *Aphis fabae*, *Impatientinum asiaticum* and *Semiaphis heraclei*. The remaining taxa (12 sequences) occurred sporadically on the studied *Impatiens* species (*I. glandulifera*, *I. parviflora*).

We found that Impatiens species in Europe exhibit low aphid diversity and do not demonstrate a correlation with specific aphid species. We did not see evidence of the degree of invasiveness of *Impatiens* impacting aphid diversity. The Asian aphid species, *I. Asiaticum*, was recorded on all host plants and *Aphis fabae* except *I. edgeworthii*. *Semiaphis heraclei* occurred only on *I. noli-tangere* and *I. capensis*.

Session 1 – Risk assessment and management of invasive species

CORTADERIA SELLOANA, A PARADIGM OF DISREGARDED HEALTH-IMPACTING WORLDWIDE INVADERS IN URBAN AREAS

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Invasive plant species suppress local biodiversity, affect soil properties and modify the landscape. Currently, there is growing concern to limit their expansion in lands of special natural interest and this is beginning to attract governments and policy makers. However, a concern that has been much disregarded about plant invasions is their impact on environmental human health. This is especially so since invasive plants often are predominant in urban areas. We will discuss the case of *Cortaderia selloana* (Schult. & Schult.f.) Asch. & Graebn, as a paradigm of an invasive species with a strong worldwide environmental impact. We will summarise the recent clinical evidence of its additional impact on human health and the great potential expansion of the species in the context of climate change. We will also outline other invasive species known or suspected to hit human health. *C. selloana* constitutes a very visible example to demand from policy makers urgent and efficient measures to control or to eradicate invasive species, also in urban areas. This aggressive invader is still out of significant binding international invasive species catalogues and is still subjected to extensive trading in some European countries. We will discuss the strong need that *C. selloana* is included in the European List of Invasive Alien Species of Union concern, in order to impose total restriction on keeping, importing, selling, breeding and cultivation.

Session 5 – Conservation issues and biological invasions

CHANGES IN MACROINVERTEBRATE COMMUNITIES ASSOCIATED WITH NATIVE MACROALGAE ALONG A GRADIENT OF COLONIZATION OF THE INVASIVE SPECIES *RUGULOPTERYX OKAMURAE*

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The area of the Strait of Gibraltar supports a high intensity of maritime traffic which, together with the existence of highly urbanised coastal áreas, e.g. Bay of Algeciras, makes it a point of entry and settlement for numerous IAS. In recent decades, several IAS with great invasive potential and ecological impact have been detected, such as the invasive macroalga *Rugulopteryx okamurae*. Expanding throughout the Strait of Gibraltar since 2015, this species is causing significant ecological and socio-economic damage. This exotic macroalga adapts quickly to the new environment, displacing key native seaweed species from an ecological point of view, and threatening biodiversity. Native macroalgae are crucial for providing habitat and sustenance to diverse marine life, fostering epifaunal communities pivotal for controlling epiphyte proliferation and serving as a vital food source for seabed-dwelling fish. In this study, we evaluate changes in the macroinvertebrate community associated with the habitats provided by the native macroalgae in the intertidal fringe affected by the invasive species *R. okamurae*. For this purpose, different sampling points were selected in the provinces of Málaga and Cádiz (South Iberian Peninsula), following a gradient in the invasion process between them. During low tide on days of maximum tidal amplitude, native macroalgae specimens were collected from sampling locations and transported to the lab for macroinvertebrate community analysis. Overall, this approach provides evidence on the evolution of the ecological impact of the invasive species' ecological impact, particularly on the macroinvertebrate communities associated with the habitats provided by the macroalgae, key elements for the maintenance of the benthic food web.

Session 1 – Risk assessment and management of invasive species

EVALUATING THE PREDATION PRESSURE EXERTED BY THE YELLOW-LEGGED HORNET ON NATIVE POLLINATOR COMMUNITIES

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Since the introduction of the yellow-legged hornet (*Vespa velutina nigrotorax*) to Europe, numerous authors have described its threats to beehives and native species. However, the potential impact of this species on pollinator communities remains understudied. In this study, we investigated the effects of the yellow-legged hornet on pollinator communities frequenting populations of ivy (*Hedera* sp.). Firstly, we conducted surveys of pollinator species visiting ivy flowers across several distinct localities. Secondly, we monitored hornet behaviour using audio recordings. Individual hornets were selected and visually tracked while their behaviours were described in real-time, capturing their interactions within the environment. Canonical analysis of the pollinator survey data revealed that day and time emerged as significant factors influencing community composition, whereas the influence of the number of hornets and surveyed localities was lower. Observation of the Asian hornet's behaviour indicated a low predation pressure, with less than 1% of the approximately 760 recorded attempts resulting in the successful capture of a native species. Overall, these results suggest that the yellow-legged hornets could exert a lower impact on native pollinator communities than previously thought. This study contributes to a better understanding of the ecological impacts of the yellow-legged hornet invasion, challenging the common perception of this species as a threat to wild insects.

Session 1 – Risk assessment and management of invasive species

FIRST ASSESSMENT OF ENVIRONMENTAL IMPACT OF THE ALIEN PLANT SPECIES OF ARMENIA

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Assessing potential environmental impacts of biological invasions is a priority on both global and local scales. It's one of the most important tools for supporting decision making-process regarding introduction, control and management of alien species. This task is crucial for Armenia, as the last two decades have been dedicated to researching different aspects of invasive plant species. However, there is still a lack of comprehensive results, an officially approved list of invasive alien species, measures for their management and control, and their incorporation into national strategies and action plans related to biodiversity and nature conservation.

50 woody and herbaceous alien plant species of Armenia included in GRIIS Checklist of Introduced and Invasive Species (including over 400 species) were evaluated using IUCN EICAT methodology based on literature review and field observations. According to the results all species that already have a status of invasive or potentially invasive species are categorized under major (MR) or moderate (MO). For species categorized under minor (MN) and minimal concern (MC) spread trends should be followed and monitored and reassessed after a certain period of time.

This work is part of an ongoing advanced research project (21AG-1F004) focusing on the comprehensive analysis of alien plant species in Armenia. Specifically, we aim to conduct a complete inventory of all plant species introduced intentionally or accidentally, assessing their current distribution in Armenia, invasive potential, as well as their current and predicted impact on biodiversity, ecosystem services, Nature's Contributions to People, and the quality of life.

Session 5 – Conservation issues and biological invasions

MULTITROPHIC RESPONSES TO MULTITROPHIC CONSERVATION INTERVENTIONS: NON-TARGET SPECIES RESPONSES TO BIOLOGICAL ERADICATIONS ON AN ISLAND

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Small offshore islands serve as refuges for threatened species, especially birds. However, they face risks from the incursion of non-native predators. Eradication projects are increasingly being undertaken as a conservation intervention. Though such projects are beneficial for target species of conservation concern, eradications can cause broader impacts on island ecosystems and trophic structure.
This project focuses on LIFE Raft - an RSPB led, EU-funded multi-trophic eradication program on Rathlin Island, removing ferrets and brown rats. It aims to analyse non-target species' responses over three years: before-during-and-after eradication. Various technologies are being used, including camera traps and acoustic recording to monitor terrestrial mammals and breeding birds. In addition, in-person surveys assess impacts on ground-nesting birds and their reproductive success. Data collected is being processed using machine learning tools, enabling the examination of immediate and short-term impacts such as population changes, vigilance behaviour, distribution, habitat use, and reproductive success throughout the eradication process. The preliminary results of monitoring from first stages of the eradication - ferret eradication, are presented highlighting changes in population size and distribution of lagomorphs and other terrestrial vertebrates.

Session 3 – Global change and invasions

INVASION RISK OF THE CURRENTLY CULTIVATED ALIEN FLORA IN SOUTHERN AFRICA IS PREDICTED TO DECLINE UNDER CLIMATE CHANGE

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Alien species can have massive impacts on native biodiversity and ecosystem functioning. Assessing which species from currently cultivated alien floras may escape into the wild and naturalize is hence essential for ecosystem management and biodiversity conservation. Climate change has promoted the naturalization of many alien plants in temperate regions, but whether outcomes are similar in (sub)tropical areas is insufficiently known. In this study, we implemented species distribution models to evaluate the current naturalization risk of 1,527 cultivated alien plants in 10 countries of Southern Africa and to assess how their invasion risk might change due to climate change. We assessed changes in climatic suitability across the different biomes of Southern Africa. Moreover, we assessed whether climatic suitability for cultivated alien plants varied with their naturalization status and native origin. Our results confirm that the area of suitable climate is a strong predictor of naturalization success among the cultivated alien flora. In contrast to previous findings from temperate regions, however, climatic suitability is generally predicted to decrease for potential aliens across our (sub)tropical study region. While increasingly hotter and drier conditions are likely to drive declines in suitability for potential aliens across most biomes of southern Africa, in some the number of potential invaders is predicted to increase under moderate climate change scenarios (e.g. in dry broadleaf forests and flooded grasslands). We found that climatic suitability is expected to decline less for aliens originating from continents with the tropical biome or from the Southern Hemisphere. In addition, we found that the climatically suitable area will decline less for aliens that have already naturalized in the region. While the number of potential invaders may decrease across southern Africa under future climate change, our results suggest that already naturalized aliens will continue to threaten native species and ecosystems.

Session 1 – Risk assessment and management of invasive species

THE FUNCTIONAL PERFORMANCE OF INVASIVE AQUATIC PLANTS ACROSS NATIVE AND INVASIVE RANGES: A LOOK BACK AND A STEP FORWARD WITH DIVE IN MSCA-GLOBAL PROJECT

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Biodiversity and ecosystems are facing the imperative challenge posed by invasive species responsible for substantial impacts on habitat integrity and ecosystem functioning. Freshwaters are particularly susceptible to invasions, impacting both the functioning and services that these ecosystems provide. Here we present the vision of the MSCA-Global DIVE IN project ("Predicting DIVErsity of INvasive aquatic plants") that aims at understanding the mechanisms underlying invasion performance of aquatic plants. We will do so by determining and predicting the spatial range of functional variation of three highly invasive freshwater plants (*Elodea nuttallii*, *Pistia stratiotes* and *Trapa natans*) in response to environmental conditions. This will be obtained in three steps: description of strong leaf traits-environment relationships, prediction of trait variation at a continental scale, and validation of the observed trends with controlled growth experiments, including the measurement of growth rates and traits variation.
This will be done by integrating spatial modelling with functional ecology, thereby creating a functional biogeographic platform for studying plant invasions in freshwater systems, thus providing the opportunity to understand functional adaptations across different spatial scales and environmental gradients.
Freshwater habitats and invasive aquatic plants often do not follow the consolidated paradigms of terrestrial taxa distribution models, in terms of environmental drivers and realized ecological niches. Therefore, this contribution aims at summarizing existing scientific literature related to spatial modelling of invasive plant species distribution and performance, highlighting gaps and issues of dealing with unique aspects of freshwater ecosystems. Finally, a focus on the DIVE IN project will be provided – which is planned to begin in summer 2024 – and how this project will advance knowledge on the influence of invasive freshwater plants on the functioning of invaded habitats at medium to large scale.

Session 5 – Conservation issues and biological invasions

PROJECT LIFE TETIDE ON CAPRAIA (TUSCAN ARCHIPELAGO, ITALY), MANAGEMENT OF INVASIVE PLANTS SPECIES IN MEDITERRANEAN ISLAND ECOSYSTEMS

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EU LIFE program, dedicated to the funding of projects for the environment and climate action, represent an important financial tool that makes feasible the conservation of habitats and species throughout the management of biological invasions. The project LIFE TETIDE (Turning Eradication Targets Into Durable Effects) focuses on the conservation of habitats and native species through the management of invasive alien species and the involvement of island communities in active conservation efforts.

Among the project tasks, the work package 3 aims to increase the conservation status of Natura 2000 habitats on Capraia Island throughout the control and eradication of invasive alien plants (IAPs: *Opuntia stricta*, Opuntia ficus-indica, *Zantedeschia aethiopica*, *Nicotiana glauca* and *Chasmanthe floribunda*). Furthermore, WP10 foresees the monitoring of the habitats most impacted by this species.

To fulfil this purpose WP3 foresees i) the creation of an updated map of the target invasive species, in preparation for their removal ii) local control of *Chasmanthe floribunda* in public areas of Capraia settlement iii) planting of native species in areas subjected to removal of IAS iv) distribution of native plants with ornamental values to the citizen. As a first step towards the drafting of an executive project for the interventions of removal we conducted a detailed map of the current distribution of the target invasive plants. Further experimental trials for the correct management of the waste material will be crucial for choosing the type of intervention and its costs.

As revealed by mapping, invasive species were more prevalent in areas of the island with higher levels of anthropogenic pressure and disturbance, while only O. stricta also spread to natural habitats. Overall, the invasion extends over 71 hectares (3.6% of the island's surface), of which approximately 70 hectares are invaded by O. stricta threatening several hectares of habitats worthy of conservation.

Session 3 – Global change and invasions

THE UPDATED GLOBAL NATURALIZED ALIEN FLORA (GLONAF 2.0) DATABASE

Amy JS Davis[1], Wayne Dawson[2], Franz Essl[3], Holger Kreft[4], Jan Pergl[5], Petr Pyšek[5,6], Patrick Weigelt[4], Marten Winter[7], Mark van Kleunen[1], others

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GloNAF is a continuously updated, curated compilation of alien naturalized vascular plant inventories for geographic regions from around the world. Building on its predecessor, GloNAF 2.0 introduces major updates including the standardization of scientific names using the World Checklist of Vascular Plants (WCVP), replacing the now defunct The Plant List (TPL), corrections of false records and the addition of 324,391 new records. These new entries have doubled the size of GloNAF and have resulted in a 42% increase in the number of naturalized taxa in the database and a 51% increase in the number of geographic regions compared to GloNAF v1.2. In this poster presentation, we will provide an overview of GloNAF 2.0, highlighting its expanded geographic and taxonomic coverage and estimated completeness by region. We will also present useful workflows and scripts for key mapping and analysis tasks using GloNAF data and illustrate interoperability with other databases such as the World Checklist of Vascular Plants (WCVP) and the Global Inventory of Floras and Traits (GIFT). In addition, we will discuss our commitment to FAIR data principles, detailing efforts to improve data accessibility, metadata standards, and promote data reuse. GloNAF 2.0 represents a significant and comprehensive resource for researchers to further our understanding of the drivers and consequences of biological invasions and naturalization success.

Session 2 – New tools and approaches for detection and monitoring

THE FDEMIC PROJECT – TRACKING THE ROLE OF ALIEN AND INVASIVE SPECIES IN THE TRANSMISSION CYCLE OF FLAVESCENCE DORÉE (FD) PHYTOPLASMA IN SERBIA

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Flavescence dorée (FD) is a quarantine disease of grapevine caused by FD phytoplasma (FDp). This quarantine disease severely impacts both vineyard productivity and landscape management in Europe's key viticultural regions. While the pathogen itself is native to Europe, its transmission cycle is associated with several wild host plants, both native and alien, and a number of native and alien insect vectors. In addition to native plant species (*Alnus glutinosa*, *A. incana*, *Salix* spp., *Clematis vitalba* and *Corylus avellana*), alien plants (*Ailanthus altissima* and *Vitis riparia*) also act as constituents of the epidemiological cycle, forming part of the transmission route as plant reservoirs carrying FDp genotypes in riparian areas. Similarly, native and alien insect vector species constitute the routes of transmission inducing FDp outbreaks, as part of specific pathosystems. An alien leafhopper of Nearctic origin, *Scaphoideus titanus*, is well-known to be the main vector of FDp. Additionally, another alien leafhopper of Asian origin, *Orientus ishidae* (the mosaic leafhopper), has been identified as a potential vector spreading FDp genotypes, thus posing an additional risk to European vineyards. The presence of established populations of *O. ishidae* have recently been confirmed in Serbia, where it was found in riparian areas in association with an invasive plant *V. riparia*. Consequently, the primary goal of this project will be to focus on natural riparian habitats and transmission cycles between and among native and exotic plants and planthopper/leafhopper species to understand how they interact with the vineyard agroecosystem and lead to FD outbreaks. Moreover, given that the Balkans is tentatively considered as the area of emergence of the FD3 genotypes inducing FDp epidemics, by studying its natural sources and reservoirs, we also aim to shed light on the monotypic epidemic of FD3 in the vineyards of Serbia.

This research was supported by the Science Fund of the Republic of Serbia, #6808 Grant No., Endemics and epidemics of grapevine Flavescence dorée (FD) phytoplasma – tracing and tracking transmission routes – FDemic. The authors would also like to acknowledge the financial support of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grant No. 451-03-66/2024-03/200010).

Session 5 – Conservation issues and biological invasions

AQUATIC NIS IN THE AZORES AT THE BLINKING OF TWO DECADES OF RESEARCH AND MONITORING

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The central position in NE Atlantic makes the nine islands that constitute the Azores an important stopover in transatlantic routes. The main vector for mNIS in the archipelago was previously established as hull-fouling, and recreational marinas were considered high-risk areas for invasive species' entrance into the region. Here, we present the evolution of the situation since the first historical reports on non-indigenous species and introductions, research and monitoring programs carried out since 2007, present invasions, and future perspectives in terms of research, monitoring and management.
The oceanic character of the islands makes them particularly vulnerable to biological invasions, and new records of previous unobserved species have been accruing at an alarming pace. We believe the aquatic NIS will keep increasing as a consequence of the ongoing climate change, visitation, marine traffic, and sampling effort increments.

Session 6 – Pathways and dispersal of invasive species

PRESERVING BIODIVERSITY: TACKLING INVASIVE ALIEN SPECIES THROUGH THE LIFE ORNAMENTALIAS PROJECT

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Our new project LIFE OrnamentalIAS addresses the significant threat posed by invasive alien species (IAS), focusing on invasive alien plants (IAP) introduced through the ornamental plant trade. These IAPs endanger species and habitats of EU importance (Council Directive 92/43/EEC). The project operates on three levels: preventive action, early detection and rapid response (EDRR) system, and management and eradication efforts. Preventive measures target the introduction of IAP by raising awareness among stakeholders and the public, focusing on reducing the spread of IAP from urban areas and improving green waste disposal practices. The upgrading of the EDRR system is one of the main goals, particularly within the agriculture and water management sectors. Collaboration with the water management and agriculture sectors is instrumental in achieving project objectives in EDRR system development and implementation. Ensuring the sustainability, transferability, and scalability of project results is vital. This involves integrating outcomes into future plans, fostering knowledge exchange, and enhancing capacities across sectors to prevent IAP spread, preserving habitat types and species of EU importance, and enable successful eradication or management of IAS of Union concern (Regulation (EU) No 1143/2014). Additional project objectives include assessing the invasiveness of ornamental plants, promoting non-invasive alternatives, harmonizing a code of conduct for horticulture with participatory approach, and exploring alternative uses for IAP material to promote circular economy principles. The transnational transfer of knowledge and the development of joint activities between Slovenia and Croatia are an integral part of the project's success, as they encourage cooperation and use expertise to effectively manage the spread of IAS. Through these concerted efforts, the LIFE OrnamentalIAS project aims to contribute to biodiversity conservation and IAS management in the EU.

Session 1 – Risk assessment and management of invasive species

HOW CAN RESEARCHERS SUPPORT THE EU IAS REGULATION?

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Successful implementation of EU Regulation 1143/2014 on the prevention and management of the introduction and spread of invasive alien species is largely dependent on raising awareness of its existence and the details of its functioning among different stakeholder groups. One such group, which can play a key role in contributing to the implementation of the Regulation, is the scientific research community from both private and public institutions, working in fields such as conservation biology, behavioural ecology, wildlife management and others, with a specific focus on invasion science (e.g. species, concepts, management). Here, the different articles of the Regulation are presented and briefly explained, indicating what specific measures and actions should be taken by researchers working in EU Member States to support each of these, while keeping in mind the obligations under the Regulation. These range from general aspects such as filling the knowledge gaps regarding occurrence, distribution and impacts of IAS, contributing to the study or development of the most effective techniques to manage them, and immediately reporting the presence of a newly found IAS of Union concern in their country to the relevant Authorities (so they can subsequently report it in the Notification System of the European Alien Species Information Network - EASIN). Having a broad overview of the various provisions set by the Regulation and understanding how exactly to contribute towards its objectives, will hopefully assist researchers, and consequently relevant Authorities, in becoming part of the solution to tackle biological invasions in the EU and beyond.

Session 1 – Risk assessment and management of invasive species

PROFILING FUNGAL COMMUNITIES OF *CENCHRUS SETACEUS* – FITNESS OR ISLAND DEPENDENT?

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Cenchrus setaceus is a real threat to Canary Islands ecosystems. Plant fitness juxtaposed with fungal microbiome may bring useful insights for its biocontrol. Leaves from *C. setaceus* were collected from 39 and 13 locations in Tenerife and La Palma Islands, respectively. Within each location, three different plants were selected per level of plant fitness (low and high). The pre-defined levels of fitness using the number of inflorescences, base perimeter and foliar biomass were confirmed by statistically supported differences ($p<0.05$). DNA was purified from leaves, and the ITS1-5.8S-ITS2 region was amplified using fungal-specific primers. Four sets of 96 amplicons were indexed, pooled and sequenced, with the nanopore MinION-Mk1C platform. Sequence-reads were processed using the MiniKNOW software, while SCATA, BLAST, Phyton, and R programming were used for taxonomy assignment and statistical analysis. After sequence quality control, 8419 and 2248 sequences were retained for high and low fitness groups, respectively. Uniform Manifold Approximation and Projection (UMAP) analysis of fungal genera frequency revealed the underlying structure and the relationships between the fungal communities of both plant fitness groups and islands. UMAP plot revealed dissimilar characteristics of fungal communities between islands, but especially a segregation considering plant fitness level. However, Analysis of Similarities (ANOSIM) with Bray-Curtis similarity index showed dissimilarity in the fungal communities considering plant fitness level ($R = 0.4$, $p<0.05$), contrary to islands ($R = -0.01$, $p>0.05$). A list of potential facultative pathogens was elaborated using frequencies of identified fungal genera, considering their plasticity to micro-climate adaptation (coast or hills) and their capacity to colonize both levels of plant fitness. Interestingly, among the 216 identified genera, we have detected a colonization pattern of Pleosporinae, an important order in fungal pathogens, here comprised by 11 genera of three families: Didymellaceae, Phaeosphaeriaceae and Pleosporaceae.

Session 5 – Conservation issues and biological invasions

BEHIND THE SUCCESS: TRAIT (DIS)SIMILARITY OF AN ALIEN AND NATIVE SPECIES AND ITS CONSEQUENCE ON THE POSSIBLE PERFORMANCE

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The position of an invasive plant species in the functional trait space can be a key factor determining invasion success and co-occurrence with native species. We aimed to test two alternative hypotheses based on functional traits: (1) if limiting similarity is dominant, less similar species are more associated with invasive ones, or (2) if environmental filtering is more important, more similar species are more associated with invasive ones.

We used data from a regional grassland survey (plot size: 25 m^2, n=161), conducted in Central Hungary. We focused on the two most common invasive species of grassland habitats: clonal perennial Asclepias syriaca and annual Conyza canadensis. Trait similarity between species was measured by weighted Gower distance using three sets of traits: (1) eleven traits covering all aspects of life history, (2) traits related to reproduction, and (3) traits related to persistence.

To describe the position (centre or periphery) of the two invasive species in the trait space, we used these similarities. We fitted generalised mixed models with the presence/absence of all other species as dependent variables, trait similarity to invasive species, and cover of invasive species as predictors for the two species separately.

We found that both invasive species were in the trait range of the regional species pool. *Conyza* was more close to the regional average of trait space than *Asclepias*. Similarity to Asclepias and its cover interacted to influence the occurrence of other species: where the cover of Asclepias was high, similar species occurred with a higher probability. We found no such interactive effect in the case of *Conyza*.

These results suggest that for perennial invasive species *Asclepias*, trait similarity may influence community composition: this result indicates that environmental filtering is the primary process. In contrast, in the case of the *Conyza*, results suggest a more random assembly.

Session 1 – Risk assessment and management of invasive species

NICHE DYNAMICS OF NON-NATIVE PLANTS VARY BETWEEN REGIONS

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Biological invasions pose a major risk to global biodiversity. When developing invasion risk assessments, model predictions often rely on the assumption that a species will conserve its environmental niche when introduced to a new range. While this assumption has been widely debated, recent literature suggests a tendency towards niche conservatism. The main problem, however, is that we still do not know for certain which factors determine whether a species will conserve its niche when introduced to a new range and how this might differ if an alien species is introduced to different regions. Here, we quantified the niche dynamics of more than 300 non-native plant species that have been introduced to different parts of the world. Specifically, we used ordination to calculate the niche overlap between native and introduced range (based on Schoener's D) and the niche metrics stability, expansion and unfilling. Significance was tested using null models. Finally, we conducted phylogenetic and trait analyses to evaluate the impact of phylogeny, native range characteristics, and species traits on niche dynamics. Results indicate an overall high level of niche conservatism. Niche unfilling varied considerably based on geographic context, generally being higher when introduced to island compared to mainland systems. Our study provides important insights into how the niche dynamics of introduced plants differ between different regions.

Session 2 – New tools and approaches for detection and monitoring

USING A TOWED CAMERA FOR LARGE-SCALE MAPPING OF THE INVASIVE MARINE ALGA *CAULERPA CYLINDRACEA* SONDER, 1845 IN CROATIAN WATERS (ADRIATIC SEA)

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Large-scale monitoring of non-native species in marine habitats presents considerable challenges. We present a newly developed approach to monitoring that combines a simplified but highly functional towed camera with onboard GPS and an online spatial database for video analysis, geotagging, and exporting data in GIS format for further processing. The camera (GoPro) is installed within a stainless steel frame to provide protection, which is equipped with two fins, a red filter for shallow depths, two lights for larger depths, and a digital scuba depth meter positioned within the camera's field of view. The towed camera is handheld using a 7 mm rope. While a surface monitoring option is not provided, this approach produces minimal drag. Multiple video transects were surveyed for the National Benthic Habitat Mapping project in Croatia (Adriatic Sea) in 2022 and 2023. The camera was typically towed from a 3.7 m inflatable boat with an 18 hp engine. Most video transects surveyed the sea floor from 2–40 m depth, while several transects extended to a maximum depth of 130 m. This new approach enabled us to record and analyze over 3,700 video transects in less than two years. The invasive marine alga *Caulerpa cylindracea* was recorded in 565 transects in waters ranging from 1–54 m deep. The collected data is significantly larger than the previous 20-year dataset comprising approximately 100 records, obtained through national non-native species monitoring programs and citizen science. Our approach demonstrates that an inexpensive and highly efficient video recording system and online database can be used for spatially extensive monitoring of macroscopic non-native marine benthic species.

Session 2 – New tools and approaches for detection and monitoring

MOSQUITO SURVEILLANCE IN THE SEAPORT OF COTONOU, BENIN: MONITORING OF SPECIES DIVERSITY AND ASSESSMENT OF SUSCEPTIBILITY OF MOSQUITOES TO INSECTICIDES

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Seaports are one of the most important gateways for coastal countries and deserve permanent surveillance of invasive species. This study aims to monitor the species diversity of mosquitoes in the seaport of Cotonou and determine the phenotypic resistance profile to multiple insecticides. The study was conducted at the Port Autonome de Cotonou (PAC) from May to August 2022. BG sentinel traps were used to capture adults which were then identified morphologically. Additionally, larvae of Aedes and Culex mosquitoes were collected and reared until adult emergence. Four batches of 25 adult female mosquitoes, aged 3 to 5 days, were exposed to four insecticides (bendiocarb 0.1%, pirimiphosmethyl 0.25%, permethrin 0.75% and deltamethrin 0.05%) for 60 minutes using the WHO tube test protocol. Mosquito susceptibility was determined after 24 hours. The captured adults yielded 455 adult mosquitoes, divided into six species: *Anopheles gambiae*, *Anopheles pharoensis*, *Culex quinquefasciatus*, *Mansonia africana*, *Mansonia uniformism* and *Aedes aegypti*, with *Culex quinquefasciatus* predominating (54.15%) and *Aedes aegypti* (30.66%) being the second most abundant. The females of *Culex quinquefasciatus* and *Aedes aegypti* were exposed to insecticides. *Aedes aegypti* showed resistance to pyrethroids but were susceptible to bendiocarb and pirimiphos-methyl, whereas Culex quinquefasciatus was resistant to pyrethroids and bendiocarb but susceptible to pirimiphos-methyl. Mosquito surveillance in the seaport of Cotonou is essential for detection and vector control in the event of invasion by new vectors carried by boats and cargo ships.

Session 1 – Risk assessment and management of invasive species

ERADICATION PLANNING FOR INVASIVE CRAYFISH: THE CASE OF *PACIFASTACUS LENIUSCULUS* IN THE CLITUNNO RIVER (CENTRAL ITALY)

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Biological invasions represent one of the major causes of biodiversity loss in freshwaters. Early detection and removal actions carried out at small scale, applying strong catching efforts, could represent effective management tools to counteract the spread of alien species. Here we show the preliminary results of the monitoring and control plan prepared within the LIFE IMAGINE project, to contrast the spread of Pacifastacus leniusculus (Dana, 1852), an invasive crayfish of Union Concern, introduced in 2020 in the Clitunno river (Tiber River basin, Central Italy). The removal actions were conducted on average every 4 days, from June 2022 to the end of 2023, using both traps and electrofishing, intensifying the sampling frequency during summer and autumn. A total of 105 removal actions were carried out. The overall catching effort applied through the setting of traps was equal to 2014 trap/day in 2022 and 5002 trap/day in 2023. Overall, 847 individuals were removed for a total biomass of 16 kg. For each specimen, biometric parameters were recorded, and the demographic features and growth of the invasive population were assessed. The occurrence of ovigerous females, and the balanced age-based population structure in this area, attested that the species has rapidly acclimatised giving rise to a self-sustaining population. Compared to the main river, the secondary hydrographic network showed a higher trapping success. The species has so far remained confined mainly in a small tributary of the Clitunno upper stretch, where the average values of CPUE (Catch Per Unit Effort) showed a progressive decreasing trend over time, arguing in favor of the removal actions effectiveness. Even though it is unlikely that invasive crayfish could be completely eradicated within a system where acclimatization has taken place, our findings show how effective control measures are at limiting population abundance and preventing the alien species from spreading further.

Session 3 – Global change and invasions

AN OVERVIEW OF ALIEN GRASS SPECIES IN EUROPE

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Invasive species have strong negative impacts on ecosystems, and what triggers exotic species to become invasives is still left with loopholes. Europe has been and continues to be a hub for growth and continuous change and the introduction of plant species to this continent dates back to immemorial times. In this research we focused on the western Mediterranean and western-central Europe encompassing 11 countries and selected the Poaceae family as a case study. Poaceae, more commonly known as grasses, have a ubiquitous presence in the world and provide many uses for humanity through space and time. Data was compiled using scientific publications, online databases, and expert reports, and as a result 479 species of Poaceae were reported as naturalized species. Provisional data reveals that the most affected country is Belgium, and the least affected countries are Malta and Luxemburg. The percentage of invasive grass species is usually low (below 6%) but their impacts in natural ecosystems are severe. As climate dictates what zones can be settled by alien species, we analysed the climate patterns in the native and occupied regions of targeted invasive species aiming to extract correlations and trends in the study area. We also analysed the common uses of the introduced species, and six main classes were identified: ornamental, food, foraging, medicine, crop improvement, and tools. A surge in ornamental and forage uses was found; followed by tools, food, medicine, and lastly crop improvement possibly showing trends across time; these uses often reflect the needs of humanity over time. The increasing use of grass species as ornamentals in recent years, coupled with the significant environmental impacts that have already been documented, underscores the need for further research on this taxonomic group.

Session 4 – Socioeconomic impacts of invasions

"WE ARE SURROUNDED": AN ARTISTIC INTERVENTION AS AN ALTERNATIVE FOR COMMUNICATION ABOUT INVASIVE SPECIES AND THEIR IMPACTS

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Biological invasions represent a multidimensional challenge, highlighting the growing relevance of the human dimension. Crucially, effective management should not obviate public participation and awareness. In Latin America, IAS have only recently been incorporated into the public debate, and management proposals often give rise to divergent opinions and little dialogue between different actors. It is necessary to consider innovative and timely communication strategies to increase public awareness about IAS. Naturaleza Intrusa, dedicated to scientific dissemination on IAS and their impacts, has generated alternatives to increase the reach of civil society on this threat. Among the proposals to be highlighted is the week on biological invasions and the implementation of an urban intervention called "We are surrounded"."We are surrounded" aims to reach people who do not show a significant interest in environmental issues, with limited access to sources of information, or with few opportunities to observe the impacts of IAS, through a simulation of an invasion process in a public space. To allow people to experience and understand in a playful way the various changes produced by IAS. After this intervention, people ask themselves questions and reflect on the event experienced. When interacting with the intervention, people have to modify their paths due to the progressive increase of IAS in the place, represented by silhouettes, which raises questions about the origin of the observed figures. The intervention is accompanied by infographics that explain the problem and establish the relationship between what the subject experiences and the impacts that IAS generate to biodiversity. These experiences demonstrate that it is possible to broaden the scope of information and constitute a starting point to promote new approaches or discussions on the issue. Furthermore, collaboration and creativity make it possible to find new ways to address these issues and overcome the limitations of available resources.

Session 6 – Pathways and dispersal of invasive species

IMPLEMENTING A VOLUNTARY CODE OF CONDUCT TO COMBAT INVASIVE ALIEN PLANTS IN COASTAL CATALONIA TO SAFEGUARD BIODIVERSITY

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Addressing the threat of invasive alien plant species (IAPS) requires proactive measures to safeguard biodiversity, human health, and economic vitality. LIFE medCLIFFS aims at fighting against the problem of IAPS on the coastal regions of Catalonia. One of the strategies to reach this goal is a Code of Conduct, a voluntary instrument to prevent the introduction and spread of IAPS.
The LIFE medCLIFFS Code of Conduct encourages professionals in the ornamental plant sector and other ornamental plant users to (1) know and comply with regulations, (2) learn about and disseminate the project lists of invasive plants, (3) remove invasive species from catalogues and collections, (4) ensure accurate plant identification before their commercialization or use, (5) promotion of non-invasive alternatives, (6) commit to inform, and (7) advocate for environmentally friendly gardening practices. It emphasizes the role of public awareness and engagement in combating the invasive plant menace, and calls for collective action towards sustainable biodiversity conservation.
Key components of the Code include a consensus list of highly invasive species, a watch list of species with invasive potential, and a white list of non-invasive alternatives. These lists, developed through consensus among a multisector group of experts (i.e., researchers, gardeners and landscape planners, public administration, public associations, and nurseries), guide plant selection and marketing decisions, aiming to minimize the spread of IAPS.
Ultimately, the LIFE medCLIFFS Code of Conduct presents a proactive approach to addressing the challenges posed by IAPS by integrating biodiversity into the market through fostering collaboration, raising awareness, and promoting responsible ecosystem protection.

Session 1 – Risk assessment and management of invasive species

USING SPATIAL RISK MODELING TO IMPROVE INVASIVE ALIEN PLANT SPECIES MANAGEMENT IN COASTAL CLIFFS: A LIFE MEDCLIFFS INITIATIVE

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Invasive alien plant species (IAPS) present a significant challenge to global ecosystem management. The LIFE medCLIFFS initiative employs spatial risk modelling to predict the potential establishment, persistence, and dispersal of IAPS to implement effective control measures within the coastal habitats of Costa Brava (northeastern Spain); specifically targeting the habitat of community interest 1240: "Vegetated Mediterranean Sea cliffs with endemic *Limonium* spp.".
"Riskmapr", a novel spatial risk modeling tool initially developed by Froese et al. (2019, Methods Ecol Evol 10:2105-2117), enables the assessment of invasion risk posed by IAPS, facilitating rapid response to plant invasions. This tool takes into account environmental factors related to classic ecological niche model distribution. However, unlike traditional models, it also considers biological traits and dispersal capabilities of individual species and populations. Such comprehensive approach allows for more precise risk evaluations of IAPS and the development of tailored management strategies. The methodology also involves iterative processes of hypothesis generation, evaluation through field observations, and continuous updating of risk assessments. All these ensure an adaptive management approach that responds to real-time data and evolving invasion dynamics. The resulting risk maps serve to identify priority zones with high invasion risk, enabling land managers to prioritize areas for prevention, early eradication, or containment measures. Moreover, these maps assist in the identification of sensitive natural areas (e.g., those with endemic or endangered species, sensitive habitats) where IAPS could cause a detrimental effect in the near future. Lastly, they facilitate the identification of the most problematic species with higher probabilities of invasion. In summary, this innovative tool enhances management strategies for invasive alien plant species, facilitating the allocation of conservation resources more efficiently.

Session 3 – Global change and invasions

GIBEL CARP (*CARASSIUS GIBELIO*) INVASION AFTER A FISH MASS MORTALITY: CONSEQUENCE OF CLIMATE CHANGE?

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Lake Velence is a 24km^2 shallow alkaline lake in Central Transdanubia (Hungary). The Lake is characterized with a multi-purpose role in the local economy as a holiday destination and recreational fisheries (angling tourism). Fish assemblage of the lake was composed of 24 species until 2021-2022, when several fish mass mortalities occurred in consequence of an extreme drought period and water level decrement. A comprehensive standardized fish assemblage survey was carried out in order to establish the fishery management interventions. Only ten fish species were observed and a massive local invasion of gibel carp (*Carassius gibelio*) was identified. Another remarkable change in the fish assemblage composition was the significant decrease in the piscivore species, which may further affect the water quality and recreational fisheries of the lake. The main aim of this study is to show a possible scenario, how climate change can directly facilitate biological invasions directly.

Session 6 – Pathways and dispersal of invasive species

RAW WATER TRANSFERS: UNDERSTANDING A MAJOR PATHWAY OF FRESHWATER INVASIVE NON-NATIVE SPECIES SPREAD

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Raw Water Transfer (RWT) schemes occur in most countries globally, though are currently an esoteric and poorly understood pathway of freshwater invasive non-native species spread. Human population growth and climate change are exerting growing pressure on fresh water resources worldwide, leading to a rapid increase in the number of RWT schemes globally.
RWT awareness remains limited within the invasion ecology field at international levels, and relatively few direct pathway investigations have been conducted to date. Despite this relative obscurity, RWTs may support consistently higher levels of introduction effort and disperse a greater range of taxa than any other pathway of secondary spread.
The aims of this presentation are therefore: 1) to illustrate the key features and mechanistic basis of the pathway 2) discuss the underlying reasons for RWT obscurity and barriers to awareness 3) highlight pathway stakeholders and drivers 4) discuss the addition of RWTs to the pathway categorization framework adopted by the Convention of Biological Diversity 5) address the recent RWT management policies introduced in the United Kingdom 6) discuss findings from direct pathway investigations and subsequent implications for pathway risk assessments and management prioritization methods.

Session 5 – Conservation issues and biological invasions

THE OCCURRENCE OF *PHYTOLACCA AMERICANA* IN SOUTHERN POLAND - A REFLECTION ON ITS POTENTIAL SPREAD ACROSS THE WHOLE COUNTRY?

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Phytolacca americana is a herbaceous perennial plant native to North America. It was brought to Europe in the 17th century and cultivated as a dye plant. It spreads quickly in many European countries, especially in the southern and western regions, inhabiting ruderal areas and mainly open spaces in forests and forest clearings. In some countries it is classified as an invasive alien species but is not included in the list of IAS of concern to the European Union. In Poland, the species had so far the status of a casual and reported only from a few localities outside cultivation. However, in 2023, a population of *Phytolacca americana* covering dozens of hectares was found in the Niemodlin Forests, in southwestern Poland.
The research investigation aimed to collect data on the conditions of the occurrence of this species, along with developing a projection regarding its further spread in Poland. The analyses indicate that the individuals of the species were most often found here in plots with existing stands of trees, young tree plantations, as well as in clear-cuts, and on the edges of fish ponds and under power lines. Among the colonised forest communities, the predominance of coniferous stands developing on different types of podzolic soils is marked. The habitats occupied are strongly differentiated in terms of soil moisture content - however, fresh soils are the most abundant.
The current distribution of *Phytolacca americana* in the Niemodlin Forests, the observed lack of its preference for specific habitat conditions, and the possibility of its further dispersion, indicate that there is a high risk of the species spreading to other forest complexes in at least the southwestern part of Poland. Therefore, there is an urgent need to take remedial actions against this species, to prevent its spread throughout Poland.

Session 6 – Pathways and dispersal of invasive species

EXPLORING THE ROLE OF CONSUMER PREFERENCES IN INVASIVE SPECIES TRADE

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In our interconnected world, where the movement of species is facilitated by global trade, human activities contribute significantly to the introduction of alien species, some of which become problematic invaders. The lack of unified international regulations, with different legislations existing in each country, coupled with the scarcity of data on introduced species, makes illegal trade, including that of invasive species, difficult to control. To address the intricate challenges posed by trade in invasive species, a multifaceted approach is essential. Here, we aim to identify the factors that influence consumer preferences for invasive species and provide recommendations to address this issue by identifying policy gaps. Social and cultural factors influence consumer preferences that drive trade in plants, vertebrates, and invertebrates for various purposes, including ornamental, agricultural, food, bait, and pets. Desirable traits for this use often overlap with invasive traits. Consumer preferences tend to favor wild-caught species, exacerbating illegal trade and promoting the introduction and spread of species with invasive potential. We recommend making laws stricter in developed nations, equipped with more resources for controlling invasive species, often prompts trade routes to shift to developing countries, with less stringent regulations and limited capacity to mitigate invasions. Educational campaigns should be launched to raise public awareness about the adverse effects of invasive species. Providing consumers with tools such as certificates to differentiate invasive species, and offering native alternatives, can promote responsible choices during purchases. Policymakers should work towards international legislative unification while also imposing stricter laws and higher penalties for offenders. Governments should allocate more resources not only to improve trade monitoring and support developing countries in this effort, but also to fund research initiatives. Only by combining these strategies, we can effectively slow down the invasive species trade.

Session 1 – Risk assessment and management of invasive species

INCREASING TRAPPING EFFECTIVENESS FOR AN INVASIVE SNAKE THROUGH PREY PREFERENCE

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Trapping remains a central and yet challenging tool for invasive species management that requires tailoring conservation protocols to the target species ecology and biology. Suitable traps need to be accompanied by an attractive bait, which in most cases remains to be identified. Therefore, exploring prey preference of the target species is a fundamental step to improve trapping protocols effectiveness. We illustrate this by focusing on the invasion of the California kingsnake on the island of Gran Canaria (Canary Islands, Spain), whose yearly captures rely to a large extent on the use of traps baited with live mice. However, traps are only effective to a moderate extent that is clearly unbalanced with the resources required for their manufacture and management. In this context, the main objective of this research was to delve in *Lampropeltis californiae* prey preferences, tested under controlled conditions. We exposed 60 individuals to a total of 12 different prey items in three trials (4 different per trial) that we video-recorded for 45 min to analyze snake behavior. We found that snakes show limited interest for live mice, as opposed to other prey. Our results may guide future steps in the identification of a suitable bait for this elusive species, while we encourage snake management programs elsewhere to conduct similar experiences to improve knowledge on invasive snakes and reinforce conservation programs.

Session 2 – New tools and approaches for detection and monitoring

CITIZEN SCIENCE IN CROATIA - ALIEN CSI BIOBLITZ AS A USEFUL SOURCE OF DATA ON INVASIVE ALIEN PLANTS

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Citizen science is recognized as a valid approach to scientific research and one of the ways in which citizen science can be applied in biology is certainly the BioBlitz. It is a form of short-term research in a specific area, involving interested citizens, led and coordinated by scientists, with the aim of collecting a large amount of data, e.g. on the biodiversity of an area. In 2022, under the auspices of the COST Action Alien-CSI CA17122, the first simultaneous European BioBlitz was initiated and carried out, with the aim of detecting invasive alien species (IAS) in as large an area of Europe as possible. Regardless of the completion of the COST action mentioned above, the European IAS BioBlitz continued in 2023, and preparations for this year's BioBlitz have already started. Croatia also participated in this event from the beginning - in 2022 only continental Croatia was covered, but in 2023 the activities were extended to some Mediterranean areas. Taxa (mostly invasive alien plants) were recorded using the official national mobile application "Invasive Species in Croatia" (https://invazivnevrste.haop.hr/; in Croatian), and the data were validated by experts. During BioBlitz 2022, 13 taxa with a total of 196 findings were recorded, and in 2023, 28 taxa with 398 findings were recorded. The most common taxa recorded in both years were *Reynoutria* spp., *Erigeron annuus*, and *Ailanthus altissima*. A more detailed presentation and analysis of all collected data will be discussed in our report. Such activities, which encourage cooperation between science and the wider community, especially young people and retirees, can play a key role in early warning of new and/or monitoring of existing invasive species in an area. Given the positive experiences and good feedback from citizens and scientists, Croatia is planning a wider BioBlitz this year with as many participants as possible.

Session 1 – Risk assessment and management of invasive species

PERSISTENCE, ACCURACY AND TIMELINESS: FINDING, MAPPING AND MANAGING NON-NATIVE PLANT SPECIES ON THE ISLAND OF SOUTH GEORGIA

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South Georgia (353,304 ha) is part of the UK Overseas Territory of South Georgia & the South Sandwich Islands. It is located in the South Atlantic approximately 1,450 km south-east of the Falkland Islands. The landscape of South Georgia is mountainous and glaciated with only the coastal fringes which are snow free in the summer months supporting vegetation. An estimated 8% of the land mass of South Georgia provides suitable habitat for vascular plants. There are 25 indigenous vascular plants species and 41 non-native plants present in South Georgia. The objective was to develop and implement a non-native plant management strategy as an integral part of an ecosystem-based habitat restoration programme supporting rodent and reindeer eradications. Following removal of grazing pressure from introduced mammals, surveys were conducted to quantify non-native plant populations and enable a control strategy to be developed for the island. Due to the vast scale of the island, multiple seasons were required to carry out rapid surveys of key indicators. These indicators are the species, the area of plant coverage in square meters and age class (mature or juvenile); they are also used for long-term control-based monitoring of outcomes. Both survey and control data are entered into a spatial database to enable analysis and allow data informed management decisions. There are now 85 non-native plant species recorded from South Georgia. Of these, 40 species are historic and presumed extinct, 3 are widespread and naturalised; and 4 are common locally. There are 35 species (Class One) that are managed on a zero-population density basis (i.e., plants which may be present but are controlled before they set seed). Two research species require more information to classify. Spatially quantifying the distribution and control of non-native plants, has enabled the development and implementation of an effective management strategy which contributes to the restoration of South Georgia's native biodiversity.

Session 2 – New tools and approaches for detection and monitoring

DON'T SIT AND WAIT, BUT STALK AND SHOOT – DOCUMENTING THE ATTEMPTED REMOVAL OF A MUNTJAC POPULATION THROUGH REM DENSITY ESTIMATIONS (ANTWERP, BELGIUM)

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Chinese muntjac (*Muntiacus reevesi*) is a small deer of Asian origin. In the United Kingdom, a large population has developed that causes ecological and economic damage. To avoid a similar scenario on the European continent, muntjac is classified as a species of Union concern (Regulation 1143/2014). Indeed, muntjac is present in isolated populations in a few countries only. Our institute supports the removal of a muntjac population from a woodland park near the city of Antwerp (Belgium). Here, camera traps have been operational yearly during winter and spring for the past four years. Whereas population dynamics could only be assessed by Relative Abundance Indices (RAI) for the first two years (see Neobiota 2022, Estonia), we opted for a novel approach during the last two years (2022-'23 and '23-'24). Cameras were calibrated and animal movement was parameterized, to allow the use of Random Encounter Models (REM) that estimate population density. The management of muntjac in the park is a combination of shooting from high seats and ground-level stalking with thermal imaging. Management efforts were monitored along with camera-trapping. The cameras showed a well-established and healthy population of muntjac. Compared to known UK populations, the density is generally low (about 10 individuals per km²), but appears to fluctuate over time. Correlation with management is diffuse as density does not readily drop in response. Yet, the population seems to be in decline overall. This seems primarily due to increased efforts of stalking, which yielded higher success than shooting from high seats. Other processes remain to be assessed (e.g. natural mortality, migration). Whether current management flattens population growth (containment), turns the park into a sink (source-sink dynamics), or may achieve full eradication, remains to be seen. We are convinced that sharing knowledge and experiences regarding management is key to eliminate muntjac from mainland Europe.

Session 2 – New tools and approaches for detection and monitoring

AN INNOVATIVE AND EFFECTIVE APPROACH TO BRIDGE RESEARCH AND INVASIVE SPECIES MANAGEMENT: THE FRENCH EXAMPLE OF THE INVASIVE ALIEN SPECIES RESOURCE CENTER

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France is one of the most exposed countries in Europe to the threat of biological invasions, due to its position as a crossroads for commercial and human traffic, the diversity of its environments, and the insular nature of much of its territory. Thus, managing biological invasions in France mobilizes many stakeholders, including natural area managers and researchers, to organize surveillance, assess impacts, enhance knowledge, define strategies, and implement prevention and management actions. However, sharing knowledge among these different stakeholders is challenging due to differing objectives and priorities.
Following the publication of the national strategy on invasive alien species (IAS), the Invasive Alien Species Resource Center was established in 2018 from a previous national working group through a unique alliance between an association, the French Committee of the IUCN, and a public institution, the French Biodiversity Agency. The Center's actions are based on a network of over 100 experts encompassing various aspects of IAS management, including researchers, managers, NGOs, and local authorities.
The Center's activities are very diverse and include coordinating a national network of over 2000 individuals, producing technical and scientific resources such as scientific insights and summary documents to make research findings accessible to natural area managers, and compiling databases of protocols and results from over a hundred field management experiences. The Center also provides specialized training for stakeholders and workshops bringing together professionals from sectors responsible for exotic species introductions, managers, and researchers.
By placing humans at the core to progress collectively, the Center ensures effective communication among all stakeholders, including managers and researchers, to promote knowledge sharing at the national level and build collective memory about IAS. Implementing similar actions in other countries would enhance global knowledge sharing and capacity building on IAS, enabling effective management.

Session 5 – Conservation issues and biological invasions

ENDANGERED EUROPEAN EEL *ANGUILLA ANGUILLA* AND A GAME FISH IN INSULAR ECOSYSTEMS OF MADEIRA

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Initially introduced for hunting purposes, non-native game species have virtually an economic gain. In insular freshwater ecosystems game fish are also introduced supported by the misconception of biodiversity increment, rarely accompanied by monitoring of effects on ecosystems and respective native communities. Rainbow trout *Onchorhynchus mykiss* in Madeira Island fits this pattern, being introduced for recreational fisheries since the 1960s. Here, we investigated the interaction of trout with the endangered European eel *Anguilla anguilla* in streams of Madeira. Specifically, we compared the spatial distribution of both species to evaluate if they live in sympatry and whether population densities are correlated. We also tested whether population densities were correlated with main abiotic variables to rule out different habitat preferences or other constraints. We predicted that species cohabit, but that eel density would decrease in the presence of trout.

To determine population density, we performed electrofishing in 18 sites of 6 streams with eel across four seasons in 2022 and 2023. Our results show that the trout distribution is uniquely juxtaposed to that of the native fish. Environmental conditions play a part in both species' occupancy, with eels found mainly closer to the recruitment areas partially due to artificial obstacles and trout in upper reach with lower temperatures. Still, the habitat segregation hypothesis cannot be ruled out. As a proxy of species competition, we are now testing the correlation between eel body condition (determined based on Fulton's index) and trout abundance. We expect to find a reduction in the fitness of eels when in sympatry with the trout. Our study represents a case study about the impact that introduced game fish have on native ones on insular ecosystems and results will support fish management policies in Madeira region.

Session 1 – Risk assessment and management of invasive species

PLANT-SOIL INTERACTION IN RELATION TO SILICA AVAILABILITY AND UPTAKE BY THE INVASIVE GRASS *CORTADERIA SELLOANA*

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Some invasive species are early colonizers of shallow soils of perturbed areas. In such conditions, plant-soil interactions may be a strong driver of invasiveness. *Cortaderia selloana* is an invasive plant species from South America with massive seed production and pioneer colonizing ability. The species colonizes perturbed areas with no vegetation indifferently of soil types, from acid to highly basic soils. Here we present results from different experiments aimed to identify the response of the plant to silica availability mediated by acidity in the soil. Silica is a prominent component of the leaf in this species, thus a potential proxy of invasibility. We found higher silica concentrations in leaves from plants growing in acid soils than those from basic soils. In another experiment, seedlings of *C. selloana* showed a higher growth rate and silica accumulation as a response to increasing levels of silica concentration in water. Differences in plant height and aerial biomass were higher than control in plants watered with a 3mM silica solution, but similar to control in a 1.5 mM treatment. In turn, silica accumulation in leaves increased gradually. Silica can modulate plant performance and correlate with high photosynthetic efficiency and eco-physiological traits. These results may aid in the design of species-specific measures to counteract the colonization by *C. selloana* and promote competition by native species.

Session 2 – New tools and approaches for detection and monitoring

ENVIRONMENTAL DNA (EDNA) TO TRACE INVASIVE SPECIES DISTRIBUTION FROM DIFFERENT ENVIRONMENTAL MATRICES

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The use of environmental DNA (eDNA) to monitor and analyze changes in species distribution is a powerful and non-invasive method. This approach leverages the genetic material that organisms release into their environment, allowing researchers to track subtle shifts and fluctuations in ecological patterns. Here we describe the results of various projects carried out in recent years in the Friuli Venezia Giulia (FVG) region using this innovative approach.

Water samples were collected for detecting *Pseudorasbora* parva and in the Grado-Marano lagoon for detecting *Callinectes sapidus*. Samples were also taken in neighboring Slovenia to detect *Procambarus clarkii* after a deliberate release and a rapid and massive eradication campaign. Furthermore, we used an eDNA approach to investigate the presence of the lethal pathogen *Haplosporidium pinnae* in *Pinna nobilis* by collecting their feces and pseudofeces in the Gulf of Trieste. All extracted eDNAs were processed by qPCR with species-specific assays based on hydrolysis probe chemistry. The occurrence of *P. clarkii* in Slovenia was confirmed and, for the first time, two previously uninfested sites were classified as positive. The barcoding study of *P. parva* provided the first comprehensive map of the species' distribution in the FVG region. Prior to this study, data on this species was patchy and did not cover such a large area. The monitoring of the blue crab in the Grado-Marano lagoon, an ongoing project, shows the path of this invasive species from the marshes to the inner waters. Finally, after the first mass mortality of fan mussels in the Gulf of Trieste in 2019, *H. pinnae* was detected in the feces of live *P. nobilis* using the non-invasive eDNA approach. The results obtained enabled the detection of alien and invasive species as well as early-stage pathogens of species experiencing massive declines. eDNA has proven to be crucial when surveying large areas to create preliminary distribution maps of target species and evaluate potential early eradication methods to counter the spread of invasive species.

Session 1 – Risk assessment and management of invasive species

MANAGING INVASIVE LIZARDS AROUND THE GLOBE: INSIGHTS AND CHALLENGES

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A review of the management efforts toward populations of invasive alien lizards worldwide is presented. Invasive alien lizards may pose a threat to biodiversity, mostly through competition with other reptiles, predation and spread of pathogens. Potential human health issues are also documented. Despite this, the literature on the topic is not very rich. Information on techniques, their efficacy, and costs, is rather scanty. Management practices for lizard removal usually involve hand removal and different kinds of trapping, according to the species' size/behavior and/or other factors such as cost-effectiveness, ease of transport, etc., occasionally coupled with complementary techniques for collecting or restricting the movement of individuals or detecting burrows (e.g. nets, fences, trained dogs, borescopes). Specifically for the small sized lizards that form dense populations, the traditional control methods seem to be especially labor-intensive, so current research efforts are focusing on testing new tools for detection and removal. They include the use of more effective toxic baits, aversive bioacoustics, drones coupled with neural networks for monitoring etc. Either way, complete eradication of invasive lizard populations in most cases is unsuccessful, which is the reason that prevention of new releases (including against re-colonisation where management actions occur) is crucial for lizard species. In this rationale securing government funding and/or engaging public support appear to be the main challenge for this animal group, as highlighted from paradigms of removal efforts around the world. Even so, volunteers are currently valued as an affordable tool for managing IAS and so different approaches have been implemented for their recruitment in lizard control programs. Increased circulation of information on response actions, along with data on their effectiveness and challenges, would be of pivotal importance to enhance the capacity to deal with invasive populations of alien lizards globally.

Session 1 – Risk assessment and management of invasive species

DEALING WITH THE INVASION OF YELLOW-LEGGED HORNETS IN THE NETHERLANDS: FROM LOCAL PROVINCIAL DECISION-MAKING TO COUNTRYWIDE PRACTICE

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The yellow-legged hornet (*Vespa velutina*) reached the Netherlands in 2017. Since then, it has rapidly spread and increased its numbers in the southern provinces. The province of Utrecht reported its first case in 2020 and may be at the beginning of an invasion. In the Netherlands, IAS law enforcement regarding biodiversity is decentralized, yet provinces need to collaborate on this countrywide problem. From the highly invaded south to the less than ten cases in total in the north, we all share the same task. This presentation will cover the Dutch approach to managing IAS, the provincial execution plan of Utrecht, and how these efforts work in practice, using the yellow-legged hornet as an example.

Session 3 – Global change and invasions

FITNESS CONSEQUENCES OF TRAIT-MEDIATED INTERACTIONS BETWEEN THE INVASIVE PLANT *IMPATIENS GLANDULIFERA*, NATIVE PLANTS AND THEIR POLLINATORS

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Plant-pollinator interactions can be strongly altered by the arrival of a new dominant species such as an invasive plant. So far, little is known about the impact of invasive plants on pollinator fitness. Moreover, there are conflicting results on how pollinators mediate interactions between invasive and native plants. These pollinator-mediated interactions can either be negative if invaders compete for pollinators or positive if native plants benefit from the spill-over of pollinators attracted to invaders. In this study, we aim to reconcile these seemingly conflicting findings by analyzing how traits determine fitness consequences for invasive plants, native plants and pollinators. Specifically, we will quantify 'biotic interaction landscapes', which relate the fitness consequences of an interaction to the traits of two interaction partners. To this end, we investigate how intra- and interspecific variation in plant and pollinator traits determine interactions between the invasive plant *Impatiens glandulifera*, native plant species and the pollinator community. We hypothesize that fitness effects of *I. glandulifera* on native plants and pollinators range from negative to positive depending on the traits of native plants and pollinators. In summer 2024, we conduct a large field study, in which we measure biotic interaction landscapes of plant-pollinator communities in invaded and uninvaded landscapes of high vs low pollinator diversity. We introduce a standard set of ten native phytometer plant species to each field site to test how biotic interaction landscapes are shaped by plant-pollinator trait matching and alien-native plant trait similarity. We here present our first results from this experimental field study, which will allow us to understand the mechanisms by which the invasion of *I. glandulifera* impacts native plants and pollinators. Furthermore, by extending the concept of fitness landscapes to biotic interactions, we contribute to advancing theory on how biotic interactions shape biodiversity dynamics.

Session 5 – Conservation issues and biological invasions

LONG-TERM CHANGES IN THE TROPHIC STRUCTURE OF THE LOWER GUADIANA BASIN IN THE CONTEXT OF FISH INVASIONS: AN ISOTOPIC PERSPECTIVE

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Freshwater ecosystems are increasingly affected by biological invasions, resulting in biotic homogenization and biodiversity loss. Changes on food webs associated with novel species, however, remain poorly understood and limit conservation and restoration efforts.

Here, we analysed food web changes in the Lower Guadiana Basin (LGB) which has been heavily invaded by fish over the past 40 years. Using stable carbon (δ13C) and nitrogen (δ15N) isotope ratios, we assessed trophic relationships among five native species obtained from museum archived collections (1978-1981), and among these species and five non-native species sampled in present day field campaigns (2019). Although selected based on availability, fish species represented multiple trophic levels. Baselines were established from prey found in the guts of archived specimens and primary producers and macroinvertebrates collected in present day campaigns. Samples were normalized for high lipid content and corrected for preservation effects, and analyses focused on isotopic niche, niche overlap, and stable isotope trajectories. Significant changes in isotopic values and niche positions were observed for native fish between periods. Although the direction and size of changes varied among species, in general, native species shifted to lower trophic positions in 2019, with non-native species occupying high trophic positions primarily driven by high trophic (δ15N) ranges. Niche overlap among native species increased considerably in 2019, and was also high for some non-native species. In the context of fish invasions, the trophic structure of the LGB was characterized by changes in species trophic positions, broadening of isotopic niches, and increasing potential for interspecific competition. Overall, this study highlights the value of stable isotope analysis in elucidating food web changes that may be expected in invaded areas.

Session 1 – Risk assessment and management of invasive species

RACCOON RAMPAGE: AN APPLIED GAME TO MANAGE THE RACCOON INVASION IN EUROPE

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Game-based approaches have emerged as a promising tool for raising public awareness about the impacts of invasive species and their potential management. We have developed an applied board game titled "BioInvaders: Raccoon rampage" with a focus on the raccoon invasion in Europe. In this game, players can assume different roles, representing different environmental agencies, hunters or animal rights groups, and experience a variety of challenges and actions. They must manage raccoon populations across countries through time until 2050 based on future scenarios of biological invasions that were co-created together with stakeholders and consider diverging political, socio-economic and environmental trajectories. The players need to work together to successfully reduce the raccoon's impact in Europe; yet at the same time, they have their own agendas, so they need to find a good balance between cooperation and competition to win this semi-cooperative game, a situation commonly observed in the real world. This game therefore aims to raise public awareness, while conveying the complexity of addressing biological invasion issues. We will present the development and design of Raccoon rampage and offer an opportunity to play it at the conference.

Session 3 – Global change and invasions

NEW RECORDS OF NON-INDIGENOUS MARINE SPECIES IN THE BIGGEST PORTUGUESE PORT (SINES)

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As part of the monitoring program of marine environments running in the Port of Sines since 1997, and with a recent increase of concern and legislation, the study of occurrence, distribution and abundance of marine non-indigenous species (NIS) became a priority since 2018. To accomplish this, historical data were reviewed, and NIS have been sampled in intertidal and subtidal hard-rock habitats, and in subtidal soft sediments, by visual censuses, dredging, and using PVC plates. This intensified effort has yielded new records of NIS in the region of Sines, with new records for mainland Portugal and stowaway as the major introduction pathway. In 2009, the polychaete Pista unibranchia, from temperate southern Africa, and an amphipod *Photis parvidons*, from temperate northern Pacific, were registered. In 2015, another polychaete worm was identified, *Hydroides operculata*, native to the western Indo-Pacific. In 2019, with the use of PVC plates, along with soft sediment monitoring, seven new species in this region were registered: two polychaetes, *Branchiomma bairdi*, from tropical Atlantic, and *Perinereis linea*, from temperate northern Pacific; two amphipods from central Indo-Pacific, *Aoroides longimerus* and *Erichtonius pugnax*; two tanaidaceans, *Hexapleomera bultidactyla*, from temperate northern Atlantic, and *Sinelobus stanfordi*, a cryptogenic species with uncertain native distribution; and *Botrylloides niger*, a cryptogenic ascidian from tropical Atlantic. More recently, in 2022, the isopod *Ianiropsis serricaudis*, from temperate northern Pacific was also identified. Specimens' morphological identification was carried out with the support of experts and the genetic confirmation is ongoing. Despite being a recent issue facing information gaps, these studies play a crucial role in understanding and preventing the introduction pathways of NIS. They also inform and complement prevention and management measures for stakeholders. Continuous monitoring the occurrence of these species is essential for effective management and conservation efforts.

Session 5 – Conservation issues and biological invasions

EXPLORING ASPECTS OF PUBLIC ATTENTION ON POPULAR NONINDIGENOUS SPECIES: APPLYING TOPIC MODELLING TO JAPANESE SOCIAL MEDIA CONTENTS

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Invasion culturomics is an emerging field of study that can deepen the understanding of human interactions with nonindigenous species (NIS) by gauging societal awareness and attitude toward NIS via quantitative analysis of digital big data existing on the Internet. Although hypothetical approaches have been used to examine explanatory variables that predict the amount of public attention in major studies of the realm, it has been challenging to observe direct associations between these variables. In this study, we investigated the association between people and NIS by analysing the content of texts about NIS on social media and clarifying the aspects to which public attention is directed. Specifically, we quantified tweets containing NIS names to identify popular NIS that attract a relatively large number of public attention on Japanese Twitter. Furthermore, we identified hidden topics which NIS names occurred with by applying topic modelling using latent Dirichlet allocation to tweets, and we explored topic distribution over popular NIS. We selected a relatively small number of species as popular NIS for further analysis and identified 25 hidden topics from all the tweets used in the analysis. The topic distribution over popular NIS had three patterns across taxonomic groups, viz., (1) biased among topics but consistent within taxonomic groups, (2) relatively even among topics and consistent within taxonomic groups, and (3) not consistent within taxonomic groups and with biases differing among species. These findings can provide vital insights into developing a better strategy for NIS management by approaching the social and human dimensions of NIS invasion; such a strategy would include information dissemination, environmental education, and management campaigns.

Session 1 – Risk assessment and management of invasive species

USING LOCAL ECOLOGICAL KNOWLEDGE FOR THE RISK ASSESSMENT OF THE ATLANTIC BLUE CRAB *CALLINECTES SAPIDUS* (RATHBUN 1896) IN THE MEDITERRANEAN SEA

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The impacts of marine species are underestimated or still completely unexplored because their negative effects on recipient ecosystems remain inadequately assessed. This is particularly true in the Mediterranean Sea where IAS management is often weak or absent: a clear example is the invasion of the Atlantic blue crab *Callinectes sapidus* (Rathbun 1896). Therefore, in 2023, a project named TROPHYC was launched to increase the knowledge on the biology, trophic ecology, and invasion history of C. sapidus and its impacts in the Mediterranean Sea.
One of the aims of TROPHYC is the definition of the level of invasiveness of *C. sapidus* in different assessment areas of the Mediterranean Sea using a risk screening tool (AS-ISK) integrated with local ecological knowledge (LEK) provided by a network of 43 data contributors, among researchers and private companies interested in the management of this invasive species. For this purpose, a questionnaire composed of 24 questions was created and sent to the network to obtain context-specific data on the spatial and temporal occurrence of *C. sapidus* in target areas, assess which environmental, economic, social, and cultural values are perceived to be endangered by its invasion, and to explore mitigation and adaptation options.
According to the results of AS-ISK in the assessed areas, *C. sapidus* was ranked with 'high' level of invasiveness in all the Mediterranean Sea and the highest impact was obtained in the "species/population nuisance traits sector. Despite few differences in the impact evaluation obtained from different areas, this general level of invasiveness was also in accordance with the information collected from LEK.
The integration between the results obtained using scientific and local knowledge will be useful for an advanced resolution of the ecological and socio-economical complexity of the impacts of *C. sapidus* in the Mediterranean Sea.

Session 5 – Conservation issues and biological invasions

URBAN PARKS AS POTENTIAL SOURCES OF THE SPREAD OF INVASIVE ALIEN PLANTS – A CASE STUDY OF MAKSIMIR PARK (CITY OF ZAGREB, CROATIA)

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Urban forests are the lungs of cities, but also potential pools for the introduction and spread of invasive alien plant species (IAPS). That is why the goal of this research was to determine the plant diversity of the largest urban park Maksimir (which is mostly urban forest, and a smaller part is a landscaped park) in the capital of Croatia, Zagreb, with special reference to IAPS. During the period 2002-2022, 316 ha of its surface were floristically investigated, using standard methods of floristic research, and the data was incorporated in the Flora Croatica Database (https://hirc.botanic.hr/fcd/). A total of 405 taxa of vascular plants were recorded. Most of the taxa identified belonged to the families Poaceae (8.4%), Asteraceae (7.5%), Fabaceae (5.9%), Lamiaceae (5.8%) and Rosaceae (4.7%). The analyses showed that hemicryptophytes (55.6%), as well as Euro-Asian geoelements (32.5%) and cosmopolitan plants (27.7%) dominate. Four plants belong to the IUCN category VU according to the Red Book of Vascular Flora of Croatia, and invasive alien plants were represented by 24 taxa. Although the recorded proportion of invasive alien plants (5.9%) was relatively small, it was almost twice as high as our preliminary analyses showed ten years ago (3.7%). Therefore, permanent monitoring, control and eradication is needed to prevent the spread of invasive alien plants in the surrounding areas. Early detection of new alien taxa and rapid responses are also important because part of the park directly borders the protected nature park Medvednica that includes a Natura 2000 site. Therefore, in our further research, we will expand the investigation of the invasive potential of already present and future planted ornamental plants in the park.

Session 1 – Risk assessment and management of invasive species

HORIZON SCANS OF ORGANISMS IN TRADE TO INFORM A NATIONAL FRAMEWORK FOR EARLY DETECTION AND RAPID RESPONSE

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Early evaluation of a species' potential invasiveness can aid in prevention or early detection and rapid response by prioritizing the allocation of scarce management resources. The US National Early Detection and Rapid Response (EDRR) Framework aims to reduce the long-term economic costs and ecological harm caused by invasive species. Various projects are needed to develop the institutional architecture for the framework including horizon scans to develop species watch lists. Horizon scans maximize the expertise of subject matter specialists through rapid risk assessment and building consensus around prioritized watchlists of species that could potentially enter the U.S. within the upcoming decade. These horizon scans have been divided by taxonomic group-vertebrate, invertebrate, and plants. Here I will focus on the 'Plants in Trade' scan to illustrate the process and implementation of the finalized list. The process begins with intensive data collection, including literature reviews, consultation with experts, and preliminary climate matching to compile the list of species to be considered. Next, experts use rapid risk assessment to evaluate species on the list. Results of these assessments are then peer-reviewed, and species are placed in a broad preliminary ranking. Finally, consensus building among experts is used to rank potential invaders based on the threat level. The final product is a prioritized evidence-based list that includes risk rating, a catalogue of impacts, and details on invasion pathways and secondary spread. This information will be included in hotspot analyses to determine where harmful impacts might concentrate. These outputs are then fed into management activities including target analysis, surveillance, and response measures. The final products will aid in the development of more effective biosecurity measures and conservation efforts on a national scale.

Session 5 – Conservation issues and biological invasions

BIOLOGICAL TRAITS VARIATION IN THE SIGNAL CRAYFISH (*PACIFASTACUS LENIUSCULUS*) ALONG AN INVASION GRADIENT

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The signal crayfish (*Pacifastacus leniusculus*) is one of the most invasive freshwater species in Europe, and in Portugal, it has invaded some rivers in the northeast, such as the Rabaçal River located in Montesinho Natural Park. It is known that individuals at the front of the invasion can face different ecological and evolutionary challenges from those at the core. Therefore, investigating key biological traits along an invasion gradient may increase our ecological understanding within populations with potential pay-offs for the implementation of meaningful management actions. To study the differences in key biological traits between core and front individuals, we carried out behavioral tests and isotope analysis. Significant behavioral differences were observed, where individuals at the front of the invasion showed a greater tendency to take risks for food and were more aggressive competing for space. Moreover, females exhibited more exploratory behavior than males and had quicker access to food, especially compared to males at the core of the invasion. Additionally, the SIBER model using stable isotope data (δ13C and δ15N) showed a clear distinction between the trophic niches of the front and the core, with the δ15N values being higher at the front, and those in the core consuming a broader range of food sources. Our study advances the understanding of biological trait variation along an invasion gradient. Moving beyond traditional invasion biology frameworks (i.e. focus on the species level), we uncover significant intraspecific and intrapopulation differences. These insights are fundamental for developing targeted management actions against invasive species to protect freshwater ecosystems.

Session 2 – New tools and approaches for detection and monitoring

INTEGRATED APPROACHES FOR EARLY DETECTION OF INVASIVE EUROPEAN PERCH IN PORTUGAL: COMBINING SOCIAL MEDIA DATA MINING AND ENVIRONMENTAL DNA ANALYSIS

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Early detection of biological invasions is crucial to the management of invasive species, potentially reducing their impact on the environment, economy, and human health. However, detecting invasions at this stage can be particularly challenging in aquatic systems, where these species can establish and spread unnoticed for a long period of time. Portugal and Spain are particularly affected with highly invaded aquatic ecosystems. In many freshwater systems, fish are the most introduced group, primarily due to their appeal for recreational fisheries. Most records of the impacts of new invasive species have been documented years or even decades after the initial invasion stage, by that time the species has often spread and impacted the ecosystems. European perch (*Perca fluviatilis*), native to central Europe and East Asia, was first detected in mainland Portugal in 2014. In this study, we present an integrated approach that combines data mining from social media with environmental DNA (eDNA) detection to uncover new records of European perch.

From 2021 to 2023, online angling groups were analyzed to identify potential new areas of invasion. In 2023, water samples were collected from several reservoirs and tested for the presence of European perch using real-time PCR (qPCR). The combined approach of data mining and citizen science enabled us to detect two new locations of European perch in Portugal. Additionally, eDNA analysis revealed another two new locations and two potential sites. Subsequent scientific sampling using electrofishing and gillnetting confirmed the presence of perch in Meimoa and Batocas, increasing the total number of reservoirs with European perch in Portugal to four, while the remaining locations are yet to be confirmed.

Our results highlight the potential of social media data mining for real-time updates on invasive species distribution. Additionally, when combined with eDNA-based surveys, it serves as a valuable tool to monitor wide areas more efficiently than with traditional methods. This work demonstrates the effectiveness of an integrated approach for monitoring freshwater invasive fish, with high applicability to other species.

Session 2 – New tools and approaches for detection and monitoring

CHARACTERIZING NON-INDIGENOUS MARINE FOULING SPECIES AND SETTING THE BASELINE FOR A NATIONAL MONITORING PROGRAM IN SAUDI ARABIA

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In the face of increasing coastal urbanization and maritime traffic, the introduction and establishment of non-indigenous marine species (NIS) pose ecological risks and management challenges. This study presents an unprecedented effort to characterize NIS in fouling communities along Saudi Arabian shorelines (Red Sea and Arabian Gulf) and establishes a baseline for a national NIS monitoring program. We employ a combination of morphological and molecular-based identification techniques coupled with quantification efforts to (1) build a species reference library for the country, and (2) expand and improve species detection by combining these results with sequences obtained from water and sediment samples. The fieldwork spans one year, with sampling efforts encompassing 34 sites across 11 sites, visited every three months. During each visit, five PVC settlement panels (three-month deployment period), and five water-borne samples are collected. Additionally, five scrapings from pontoons and seawalls and five sediment samples are collected. Scrapings and panels are analysed with metabarcoding, and all morphospecies are being vouchered, identified and DNA barcoded (Cytochrome c oxidase subunit I; COI). Water-borne and sediment samples are analysed for eDNA. Given the spatial and taxonomical scope of this effort, taxonomists from around the world are being invited to contribute to the morphological identification of the voucher samples. This collaboration is leading to significant enhancements of reference collections and DNA libraries, and the detection of new NIS records and species previously unknown to science. The project marks a significant step towards our understanding of the native and non-native biodiversity in man-made environments across the shorelines of Saudi Arabia. It contributes to the proactive management of bio-invasions, underscoring the importance of cataloguing and monitoring NIS on marine ecosystems. The methodologies and insights from this study can inform similar efforts in other regions facing rapid urbanization and increased maritime traffic.

Session 1 – Risk assessment and management of invasive species

IMPACT OF INVASIVE ALIEN SPECIES ON PROTECTED AREAS IN THE YUCATAN PENINSULA AND THE MEXICAN CARIBBEAN

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Invasion of non-native species is one of the main threats to conservation of biodiversity and the provision of ecosystem services. This study used biodiversity databases, public policy instruments and scientific literature to determine the presence of invasive alien species (IAS) in 37 protected areas of the Yucatan Peninsula and the Mexican Caribbean. 91 IAS were identified from all continents, which were organized into 11 taxonomic groups: macroalgae (2 species); terrestrial and aquatic plants (46); insects (6); arachnids (1); crustaceans (2); mollusks (2); marine and continental fish (11); amphibians (1); reptiles (4); birds (10) and mammals (6). According to the invasiveness assessment of the species for Mexico, 53.9% have a very high risk, 41.7% have a high risk and 4.4 have a medium risk. In order to visualize the main causes of the incursion of IAS, productive activities associated with the management of protected areas were analyzed, since it is documented that the pathways of introduction of IAS derive from recurrent anthropogenic pressures, the productive activities identified were: agriculture, livestock, forestry, fishing, aquaculture, tourism and wildlife management units. In reference to the data presented, it is concluded that protected areas are affected by the presence of IAS due to factors such as predation of native species in the best-conserved ecosystems, competition for space and food, usurpation of ecological niches, degradation of aquatic and terrestrial environments, reduction in the quality of ecosystem services, economic losses for local communities and impacts on public health, thus achieving the loss of ecological balance. The information generated in this study can serve as a reference to estimate the presence and dispersion of IAS in the biological corridors that connect the protected areas in the Yucatan Peninsula and the Mexican Caribbean, and propose regional management strategies for the prevention, control and eradication of IAS.

Session 3 – Global change and invasions

THE TRAJECTORIES OF LOCAL VEGETATION CHANGE: A LITERATURE REVIEW

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The purpose of this literature review is to conduct a comprehensive review of local and regional vegetation resurvey studies conducted worldwide. The focus of this review is to examine the key findings and conclusions derived from these studies, specifically in terms of changes in species richness and composition. Furthermore, this review aims to analyze the regional and habitat-specific variations in these changes and identify the primary drivers associated with them. By incorporating these findings, this manuscript will contribute to the current understanding of global plant diversity and propose avenues for future research. Location: Global. Time Period: 1834-2022. Taxon: Plants.

A global semi-systematic literature review was conducted to identify literature on vegetation change worldwide. Relevant studies were extracted from Web of Science and Scopus, focusing on English studies only. A two-step screening process was applied, based on three criteria: (i) a focus on vegetation data, (ii) inclusion of two temporally separate assessments of vegetation communities, and (iii) coverage of diversity metrics (species richness and composition). Studies meeting all criteria underwent a full review using a 23 category template. Review papers and meta-analyses were excluded. Our study reviewed 4,839 papers, identifying 727 meeting inclusion criteria, with 497 based on permanent plots and 230 on resurveys. Geographically, most studies were from Europe (374), followed by North and Central America (174), South America (71), and Asia (68). In terms of habitats, 45.9 % focused on forests, 25.6 % on grasslands, and the remaining on diverse habitats. Our dataset included 555 studies on vascular plants. Among the drivers of change, land-use change was the most prevalent, followed by natural succession, climate change, biological invasions, pollution, and resource extraction, with some studies considering multiple drivers. Species composition changed in 623 studies, species richness exhibited increasing or not changing trends over time.

Session 3 – Global change and invasions

LONG-TERM DIFFERENCES IN GROWTH AND IWUE FOR COEXISTING NATIVE AND NON-NATIVE SPECIES UNDER CONTRASTING CLIMATE CONDITIONS

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Nowadays, the invasion of non-native (NNT) species is one of the main factors influencing the loss of biodiversity worldwide. The main objective of this study is to evaluate the potential displacement of native (NT) tree species by non-native (NNT) species in increasingly threatened riparian forests. This assessment will be conducted within the framework of growing environmental stress, encompassing not just global warming but also anthropogenic disturbances. To achieve this, we have studied the functional strategies of coexisting NT (*Populus alba*) and NNT trees (*Robinia pseudoacacia* and *Ailanthus altissima*) in riparian forests of central Iberian peninsula (three sites with contrasting climate, i.e. warmer, intermediate and colder conditions). Using dendroecology and stable isotopes we measured secondary growth and water use efficiency (iWUE) together with their resilience after drought events. Results show the greatest growth for the NT species (*P. Alba*) in the warmest site, closely followed by *A. Altissima*. Additionally, a decrease in growth was observed for all species during recent years at all sites, but especially for *P. Alba* and *A. Altissima* at the warm site, indicating greater vulnerability to climate change for these two species. Instead, R. pseudoacacia had lower growth at the warm site, but no temporal reductions were found. Regarding drought resistance, *A. Altissima* was the species with the highest resistance to drought, while the recovery of growth after drought was higher for *R. pseudoacacia*. As for overall resilience, the NT species (*P. Alba*) showed higher values. Finally, the iWUE was higher in the warmest site for all species, though more pronounced differences were found for the NNT. Additionally, the NNT species exhibited higher iWUE values compared to the NT, especially *A. Altissima*. We discuss the long-term functional performance of these coexisting species, trying to predict the potential invasive success of the NNTs in a global change context.

Session 2 - New tools and approaches for detection and monitoring

DATAFLOWS IN SUPPORT OF CROSS-BORDER MANAGEMENT OF MUSKRAT (ONDATRA ZIBETHICUS) AND COYPU (MYOCASTOR COYPUS): THE LIFE MICA APPROACH.

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Effective cross-border management of invasive alien species is dependent on robust data sharing among responsible authorities. This need is particularly pronounced for species like aquatic rodents, such as muskrat and coypu, which rely on interconnected hydrographic networks for dispersal. The LIFE MICA project sought to enhance cross-border cooperation between the Netherlands, Germany (Lower Saxony), and Belgium (Flanders) by centralising data on the occurrence and management of invasive alien rodents. Project partners from seven institutions collaborated to develop innovative detection and management methods, such as smart camera trapping, eDNA analysis, and smart life traps for muskrat and coypu. Prior to the LIFE MICA project, management and occurrence data for muskrats and coypus in a substantial part of northwest Europe were fragmented in isolated data repositories. To address this issue, the project adopted an open data approach based on the Global Biodiversity Information Facility (GBIF), resulting in the publication of nearly one million new muskrat and coypu observations dating from 1987 to the present day. This initiative represents a significant step towards improved collaboration and data sharing in the management of invasive alien rodents across a wide geographic area in northwestern mainland Europe.

Session 6 – Pathways and dispersal of invasive species

NON-NATIVE SCOLYTINAE (*COLEOPTERA CURCULIONIDAE*) OF EUROPE: AN UPDATED LOOK.

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Curculionidae Scolytinae are one the most successful groups of invading insects worldwide and amongst the most important wood-boring Coleoptera introduced to Europe. These beetles are generally moved among continents within live plants, timber, containers, pallets and wood-packaging materials, and their introduction may result in substantial economic and ecological impacts.
Given the central role that Europe has played in world trade, the European subcontinent has been the subject of multiple introductions of non-native scolytines since historical times; in addition, despite the introduction of stricter regulations, many new species are recorded every year. Consequently, great interest is devoted internationally to species survey, early detection and, whenever possible, eradication. Furthermore, the production of new faunistic records and continuous updating of reliable and easily accessible distributional data is a fundamental step in investigating and contrasting non-native species introduction and spread.
Currently, the latest comprehensive review of the European non-native Scolytinae dates back to 2010 and it is more than necessary to update current knowledge on this group. This contribution aims to present the state of the art regarding 85 non-native taxa recorded in Europe, both as intercepted and established species. In particular, the status, invasion phase, and introduction pattern of each species are critically revised and analysed. In addition, the current distribution and spreading of established species are discussed also considering the association between biogeographic origin and biological traits.

Session 2 – New tools and approaches for detection and monitoring

STABLE ISOTOPES IN FISH EYES: A TOOL FOR UNDERSTANDING MOVEMENT, TROPHIC INTERACTIONS AND POTENTIAL INVASION ACROSS THE PANAMA CANAL

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The Panama Canal is a conduit for interoceanic invasions between the Pacific and Caribbean. However, at the center of the canal a built-in barrier against marine invaders exists in the form of a freshwater reservoir, Lake Gatun. Since its creation, marine fish species have appeared within the freshwater lake, but only few species completed an interoceanic invasion. To understand the potential of marine fish species to successfully cross the Isthmus, we must determine the ability of marine species to persist and expand within this freshwater habitat. The common snook (*Centropomus undecimalis*), a predatory fish from the Atlantic Ocean, is one species with a high potential of invading the Pacific Ocean through the Panama Canal. To understand the likelihood of this, it is vital to determine its numbers of fish and time spent within the lake. Here, we used stable isotope analysis of fish eye lenses, an archival tissue type, to identify individual movements between the marine and freshwater habitat (to understand the amount of time spent in this novel habitat), and understand their trophic resource use in the Panama Canal. Our preliminary data indicates that common snook spend extensive time in Lake Gatun. Entering at the post larval juvenile stage, they appear to spend a large portion of their development prior to sexual maturity in the freshwater habitat of the Canal. The presence of several post-larval snook in the Panama Canal will both alter the food web of Lake Gatun and increase the possibility of a cross-isthmian invasion. Stable isotope analysis of fish eye lenses has the potential to bring unique insights to better understand in real-time the potential for interoceanic fish invasions across the Panama Canal.

Session 3 – Global change and invasions

ECOPHYSIOLOGICAL RESPONSES OF ALIEN INVASIVE *SPARTINA DENSIFLORA* UPSTREAM IN AN ACID AND METAL-POLLUTED ESTUARY

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Climate change, sea level rise and pollution are key components of global change, which are causing a significant reconfiguration of ecological niches. This transformation may offer favorable conditions for the establishment and spread of alien species, another component of anthropogenic global change. Our study model was the changing invasion front of alien *Spartina densiflora* upstream along the most acidic and metal-polluted estuary in the world, the Tinto Estuary (Southwest Iberian Peninsula). Little is known about the functional traits underlying tolerance of *S. densiflora* to metals and acid pollution as it continues to colonize polluted upstream reaches. We assessed the degree of plant stress on 50 tussocks of *S. densiflora* along a c. 4500 m with an aqueous salinity and pH gradient. For this, we measured apical leaf growth rate, chlorophyll fluorescence and the rate of reabsorbed seeds. The sedimentary environment was also characterized by measuring pH and conductivity of interstitial water. The pH decreased from 7.5 downstream to 2.9 upstream, and electrical conductivity increased from 1.1 mS cm-1 upstream to 6.4 mS cm-1 downstream. Apical leaf growth was higher upstream, showing the preference of *S. densiflora* for brackish water, despite the acidic conditions. Plants located upstream showed lower actual photochemical efficiency of PSII (ϕPSII) and dissipated more energy as heat (higher NPQ). ϕPSII decreased and NPQ increased with lower sediment pH. This suggests an increased photoprotective response to excess light energy under acidic and metal-polluted conditions. In addition, the rate of reabsorbed seeds was higher upstream and increased at more acidic conditions. Our results showed that alien *S. densiflora* is very tolerant of acid- and metal-polluted conditions, however its photosynthetic apparatus and seed production are partially and negatively affected by stressful conditions upstream in the Tinto River Estuary.

Session 1 – Risk assessment and management of invasive species

COLLATING EXISTING EVIDENCE ON CUMULATIVE IMPACTS OF INVASIVE PLANT SPECIES IN RIPARIAN ECOSYSTEMS OF BRITISH COLUMBIA, CANADA

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Foreshore and riparian ecosystems are among the most vulnerable habitats to biological invasions. Non-native invasive species can outcompete and replace native species, and alter the structure and function of these ecosystems. However, their impacts are often investigated in isolation, even though one invasive species might increase or mitigate the impacts of another (i.e. cumulative impacts). In this project, we aim to (1) develop a protocol to systematically identify and collate evidence on the individual and cumulative impacts of non-native invasive species and (2) test this protocol on a set of plant species invasive to foreshore and riparian ecosystems of British Columbia, Canada. First, we developed a flexible search string to extract the available literature. Next, we screened each study against a set of criteria. Lastly, included studies were carefully examined to identify (a) investigated impacts, (b) their directionality and (c) their magnitude. We developed this protocol using an iterative approach, focusing on two pilot invasive plant species, the Russian olive (*Elaeagnus angustifolia*) and the Reed Canarygrass (*Phalaris arundinacea*). Then, we extended our searches to 10 other plant species invasive to British Columbia, Canada. We extracted and screened a total of 7,387 studies across all species. Preliminary results show great variability in research efforts, with species ranging from 0 to over a hundred studies assessing their impacts. Additionally, research gaps and clusters are species-dependent. Our protocol will help identify, collate, and examine the available evidence on the impacts of target invasive species, aiding the identification of research gaps and the prioritization of management efforts.

Session 6 – Pathways and dispersal of invasive species

COMPARATIVE GENETIC ANALYSIS OF INVASIVE MOSQUITO SPECIES IN BELGIUM SUPPORTS DIVERSE INTRODUCTION PATHWAYS

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Invasive mosquitoes present challenges to both public health and ecosystems, demanding a comprehension of their dispersal patterns and genetic makeup. This study integrates genetic analyses of two invasive mosquito species in Belgium, *Aedes albopictus* and *Aedes japonicus*, to clarify their introduction pathways and dispersal dynamics. Data were gathered through two mosquito monitoring programs, MEMO and MEMO+, with specimens collected at various points of entry (PoE), including international import companies, highway parking lots, and residential areas. A total of 254 *Ae. Albopictus* and 292 *Ae. japonicus* specimens were analysed.

The northward expansion of *Ae. Albopictus* into Belgium was investigated via active monitoring at PoEs and citizen science initiatives. Thirteen distinct COI haplotypes were identified, with one prevalent haplotype across sampling locations. The disparity in haplotype composition at import companies (indicative of long-distance introductions) versus parking lots/residential areas (suggestive of medium-distance introductions) in Belgium corroborates field observations, where tiger mosquitoes are presumed to hitchhike from established populations in neighbouring countries via passive ground transport.

The analysis of seven microsatellite loci within *Ae. japonicus* populations disclosed genetic disparities between specimens collected at one PoE before and after eradication attempts, hinting at potential new introductions after elimination campaigns. Furthermore, clustering analysis unveiled a genetic correlation between Belgian specimens collected at the border with Germany and populations in western Germany, underscoring the influence of human-mediated transport on invasion pathways.

These comparative genetic analyses underscore the significance of vigilant monitoring and targeted control strategies. The genetic investigation of *Ae. Albopictus* and *Ae. japonicus* enhances our comprehension of their introduction pathways, which is important for effective management and mitigation of invasive species' impacts on public health and ecosystems.

Session 5 – Conservation issues and biological invasions

SOCIAL-ECOLOGICAL NETWORKS AND BIOLOGICAL INVASIONS: APPLICATIONS, CONSTRUCTION, AND ANALYSIS

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Social-ecological networks (SENs) consist of social and ecological actors/entities as well as their interactions. They have been applied to study a range of complex issues such as sustainable resource use, management of ecosystem services and disservices, and collective action. The application of SENs to the field of invasion science has remained limited so far, despite their potential for mapping invasion pathways, understanding invasion success, investigating direct and indirect impacts, and improving the management of biological invasions. Here, we present an overview of how SENs can contribute to studying biological invasions and the different aspects to consider when constructing and analysing such networks. We suggest using multilayer networks consisting of ecological, geographic, technical, social, and governance layers for a more holistic understanding of biological invasions. Modelling system fluxes, such as matter, money, emotion, and information, which interconnect numerous system components, can provide insights into the larger functioning of social-ecological systems, thereby offering avenues to design management and policy solutions to complex problems. Although SENs characteristics will depend on specific research goals, we provide guidance on their construction and analysis in the context of biological invasions, encouraging a more widespread use of this powerful approach within our field.

Session 6 – Pathways and dispersal of invasive species

AMERICAN MINK (*NEOGALE VISON*) LONG-DISTANCE MOVEMENT AND INVASION SPREAD – A SYSTEMATIC COMPARATIVE ANALYSIS INCLUDING NEW DATA FROM ICELAND

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The speed of spread of invasive species is a key parameter that can influence the impact of an invasion. The faster an invasion proceeds, the more difficult it is for native species to respond phenotypically and the more significant the ecological impact. Any control measure crucially depends on timing as well; the slower the spread occurs, the more time there is to take appropriate action. In some cases, the speed of spread can be measured; in other cases, it can be approximated through home range size and long-distance movement of individuals, such as dispersal, or population growth and distribution. Despite being of such high interest, long-distance movement of invasive species is often understudied. Even for an invader of the highest global importance, the American mink (*Neogale vison*), a global comparative analysis is still lacking. We compiled data from 118 studies in 24 countries (numbers might still increase) in Europe, North- and South America and Asia on the speed of spread, long-distance movement and home range sizes. Previously unpublished data from Iceland are discussed in the framework of the global dataset. This comprehensive and unique dataset allows us to estimate the spread speed of mink across habitats and discuss potential influencing factors and sex biases in long-distance movement.
Our aim was to i) support risk and impact assessment of mink and ii) provide a database of these behavioural parameters to create a more complete profile of this widespread invader.

Session 1 – Risk assessment and management of invasive species

LIFE INVASAQUA EUROPEAN PROJECT: STRATEGIC INSTRUMENTS FOR THE GOVERNANCE OF INVASIVE ALIEN SPECIES IN AQUATIC SYSTEMS.

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LIFE INVASAQUA aimed to reduce the introduction and spread of aquatic invasive alien species (IAS) through the development of instruments to improve the early warning framework in the Iberian Peninsula. One of its main actions has been the creation of synergies and tools for environmental governance. Management tools such as priority lists of aquatic IAS (black list and alert list) have been developed in collaboration with more than sixty experts. A web platform was also developed to facilitate the transfer of geo-referenced information on taxa and to support the data transfer to EASIN (European Alien Species Information Network). LIFE INVASAQUA has worked on transnational challenges that can help to improve the management framework for invasive epicontinental fish, crabs and crayfish at the Iberian level through the development of strategic recommendations. The instruments and information aim to stimulate and support research, monitoring and management activities at regional and transnational levels. Key resources have been provided for environmental managers, NGOs and other stakeholders and results can also be applied to guide policy and identify priority IAS to be included in monitoring and management programmes.
This work is funded by the LIFE Programme of the European Commission (LIFE17 GIE/ES/000515).

Session 2 – New tools and approaches for detection and monitoring

AFTER LIFE: MANAGEMENT OF INVASIVE COYPU AND MUSKRAT IN EUROPE

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Coypu and muskrat are semi-aquatic rodents with their genuine habitat lying in South and North America, respectively, and they settled in Europe during the 20th century. They may feed on riparian vegetation or crops, dig tunnels in water banks or dams and dykes and thereby threaten ecosystems and habitats of protected species, waterway infrastructures as well as agricultural areas. Coypu and muskrat are established all over Germany and are also spreading continuously in the Netherlands and Belgium. The LIFE MICA project was a cooperation between German, Dutch and Belgian institutions with the aim of establishing an efficient management of coypu and muskrat by developing innovative cross-border methods for their population control. Among the participating institutions were waterbodies, invasive species management authorities and research institutions. New monitoring methods included the use of eDNA detection and camera trapping as early warning tools, and smart life traps should ensure the catch of target species as well as animal welfare. These methods for monitoring and management of invasive species show huge potential, and are meant to be shared, upscaled and transferred to other species. The project was nominated as one of the finalists of the Natura 2000 awards 2024.

Session 2 – New tools and approaches for detection and monitoring

HORIZON SCANNING FOR PLANT HEALTH AT EFSA: METHODS AND TOOLS TO IDENTIFY AND MONITOR IN MEDIA EMERGING THREATS FOR THE EUROPEAN UNION

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Since 2017, the European Food Safety Authority (EFSA) conducts horizon scanning activity in the field of plant health, in collaboration with the EC Joint Research Centre (JRC) and the French Agency for Food, Environmental and Occupational Health & Safety (ANSES). This activity has produced more than 120 newsletters and a number of reports. The aim of this activity is to capture signals from the web about potential threats caused by plant pests from all around the world and to convey them to EU risk managers in order to support their preparedness and timely reactions. The tools in use are Medisys and EIOS, public health surveillance systems that monitor continuously the content of more than 25,000 scientific and media sources worldwide. The items selected for inclusion in the monthly newsletters are reviewed and validated by a team of experts, while another team carries out further analysis on emerging threats not envisaged in the EU plant health legislation. This analysis (PeMo screening) is a fast procedure based on a ranking system that provides further signals on the potential risks represented by those not known or not regulated pests to risk managers in case they consider requesting more assessments by EFSA or accelerating preventive measures in the Member States. Apart from the main scope of informing decision makers, the newsletters, including the PeMo results,are freely accessible online, and rebounded in an open-access interactive dashboard. Recently, a series of workshops and webinars have been added to the agenda in order to enhance the collaboration among institutions conducting horizon scanning activity in the field of plant health and extend the applicability of this service to other realities and scopes.

Session 4 – Socioeconomic impacts of invasions

THE FIGHT AGAINST *VESPA VELUTINA* IN EUROPE: AN ASSESSMENT OF SURVEILLANCE, MANAGEMENT AND KNOWLEDGE TRANSFER ACROSS BORDERS

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European Member States are developing strategies to prevent the establishment of *Vespa velutina* (Lepetier, 1836), slow down its spread and mitigate its impacts. Despite being a listed species of Union concern, there appears to be little collaboration across borders in the establishment of uniform approaches for its surveillance and management. We assessed the variety of approaches and the extent of knowledge transfer through an online survey to responsibles for implementing the IAS Regulation.

Since we opened the survey (February 2024), to date (end of April 2024), we received responses from almost all European countries, covering countries with established populations (123 respondents) as well as countries where the species is absent (N = 49) or in early invasion stage (N = 8). The survey was mainly filled by researchers, beekeepers and government officials. Preliminary data show that most of the respondents (90%) indicated urban areas as the preferred habitat, compared to semi-natural ones (10%). Interestingly, only 26% of respondents indicated that over 50% of nests are detected whilst effective control requires higher detection rates, despite many respondents stated to have a surveillance system. Among the variety of methods reported for nest destruction, injection with insecticide is the most popular (84%). Strikingly, 23% of respondents also report the use of poison bait which is illegal in Europe. Methods like trapping queens and workers (78%), reducing the size of the hive entrance (62%) and electric harps (50%) are used to mitigate *V. velutina* impacts at beehives. Respondents expressed the need for knowledge about nests detection (56%), spring trapping and insecticide-free nest destruction techniques (48%). At the same time, there is interest to increase research linked to ecological impacts (75%) and invasion dynamics (57%). Future work should continue to sustain international collaborations, as emphasized by the majority of respondents, for a better *V. velutina* management.

Session 6 – Pathways and dispersal of invasive species

NEW PLANT INVASIONS IN ARMENIA

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Currently, in Armenia, there is an ongoing large-scale research project titled "Invasive Plant Species from A to Z: National Inventory, Impact Assessment, Control, and Management for Armenia". Within the framework of this project, a survey of the country is being conducted to detect new locations and species of alien plants. As a result, in recent years, a number of new invasions or the spread of already known species have been recorded. Below are presented alien species that were previously unknown in natural ecosystems, or have expanded their distribution, or have appeared in completely new regions of Armenia.

Impatiens glandulifera – It was first found in Armenia in 1991 in the vicinity of the village Pushkino (Northeastern Armenia). The population was very small – about 10-15 individuals. In 2023, we found that the population had increased significantly, now comprising about 500 specimens. Additionally, a new large population of this species (more than 700 specimens) was discovered in the vicinity of the village Vardablur, approximately 6.5 km from the known population

Nicandra physalodes, *Phytolacca americana* and *Amorpha fruticosa* – This is the first recorded instance of all species in Armenia under natural conditions. The unified alien ecosystem, including all three species, is located in the vicinity of the city of Alaverdi (Northeastern Armenia). The populations of the species include approximately 70, 20, and 30 individuals, respectively.

Oenothera biennis – In Armenia, only one large population has been well known between the city of Vanadzor and the village of Pambak (Northeastern Armenia) since the 1950s. We have found individual plants in new locations relatively far from the original site: within the territory of the "Khosrov Forest" state reserve (Central Armenia), in the vicinity of the city of Talin (Northwestern Armenia), and the village of Areni (Southern Armenia).

Session 2 – New tools and approaches for detection and monitoring

INVASIVE TERRESTRIAL ARTHROPODS ON PACIFIC ISLANDS: DNA OBSERVATORIES AND AI CLASSIFICATION TOOLS

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We describe a collaboration of DNA inventories and genomic observatories across the Pacific to detect and monitor invasive terrestrial arthropods. Island groups include, Hawaiian Islands, Guam and Mariana Islands, Society Islands, French Polynesia, and Okinawa, Japan. The work builds on a set of multi-national projects, including the Moorea BioCode, Hawaii NSF-Dimensions, and SERDP-Pacific Next Generation DNA Biomonitoring. The work is associated with the development of a set of tools for classifying and managing DNA data and associated information, including the Genetic Observatories Genetic MetaDatabase (GeOMe, https://geome-db.org), a web-based database that captures the who, what, where, and when of biological samples and associated genetic sequences; ni-classify (*https://github.com/tokebe/niclassify), a combined GUI toolkit for predictively classifying arthropod sequences as Native/Introduced;, and field (FIMS) and laboratory information management systems (LIMS) (Smithsonian). The data are useful not only for detecting emerging invasive species (i.e., "horizon scans", pathway analyses, targets for eDNA) but also for understanding the function and impact of introduced species in biological communities.

Session 6 – Pathways and dispersal of invasive species

TRAJECTORIES OF ALIEN PLANT SPECIES ACCUMULATION IN CENTRAL EUROPEAN ARABLE FIELDS

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We investigated the accumulation of old (i.e. *Archaeophytes*) and new (i.e. *neophytes*) alien species in arable fields across ten countries in Central Europe over a time period from 1930 to 2019. We used an extensive dataset of 21,747 vegetation plots from the AgriWeedClim database and applied generalized linear mixed-effect models. We analyzed the percentage of plots containing neophytes for regional scale dynamics, as well as the proportion and relative abundance of alien species per plot, offering insights into the local scale dynamics of alien species spread in arable fields. The dynamics of species populations in our study area revealed significant contrasts between neophytes and archaeophytes over time. The percentage of plots containing neophytes strongly increased from 34.2% in 1930 to 70.1% in 2019. The proportion of neophyte species in plots nearly doubled from 5.5% in 1930 to 10.2% in 2019. The relative abundance of neophytes followed a similar upward trend, increasing from 4.1% to 9.9%. This highlights not only the expanding spatial spread of neophytes in agricultural plots but also their increasing dominance on a local scale. In contrast, archaeophyte species displayed a different trajectory. Their proportion exhibited a modest increase from 23.2% to 25.3% over the ninety-year period, while their relative abundance slightly decreased, from 21.2% to 19.5%. A sensitivity analysis of our data further revealed that the temporal increase in the percentage of plots containing neophytes is mainly driven by a few common species with a high number of records during the study period. Our study shows an increase of neophyte species across scales in agricultural landscapes, with the potential to homogenize regional weed communities. We anticipate a growing occurrence of neophytes in local communities in the future, posing a substantial threat to regional biodiversity and agricultural management.

Session 5 – Conservation issues and biological invasions

HOW TO PLAN FOR ANIMAL RE-INTRODUCTIONS AFTER SPECIES ERADICATION IN GALAPAGOS: THE IMPORTANCE OF PLANT AND ARTHROPOD BASELINE DATA

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The majority of extinctions on islands globally have been caused by invasive species. On Floreana Island, in the Galapagos Archipelago, the introduction of rats and feral cats had devastating effects on the island fauna. For example, 12 vertebrate species are now locally extinct and 55 native vertebrate species are listed from VU to CR on the IUCN Red List. These threatened species would benefit from the eradication of invasive mammals, which would also support sustainable socio-economic development in the local Floreana population of 140 people. Therefore, Floreana is currently undergoing one of the largest projects to eradicate rodents and cats from an inhabited island, carried out by a multi-partner programme. In order to mitigate any potential impact of the eradication process on existing native species, it is critical to monitor the fauna and flora of Floreana to understand the ecological impact of the intervention. In addition, the re-introduction of the 12 species requires careful planning as well as habitat suitability studies to ensure the survival of the re-introduced species. Thus, we have been monitoring the arthropod community bi-annually since 2021 in agricultural and protected areas and the plant community since 2022. We collected arthropods by pitfall traps and sweep netting at 8 permanent sites and monitored the plant community in 24 permanent plots (10 m x 10 m), using the line-intercept method along three permanent transects through the plot. First results indicate that there are differences in richness, diversity, and community composition of arthropods in the agricultural area compared to the protected area. Similarly, there are differences in the plant communities between highland and lowland areas. This study established the baselines for the flora and arthropod communities on Floreana, providing foundational knowledge regarding the habitat suitability for the animals to be re-introduced, especially for the bird species.

Session 6 – Pathways and dispersal of invasive species

UNIFYING DATA FOR GLOBAL IMPACT: PRESENTING THE GLOBAL INVASIVE LEPIDOPTERAN SPECIES DATABASE

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Lepidopterans (moths and butterflies) are among the most diverse and impactful groups of invasive insects worldwide, with several species known to cause multi-million-dollar economic losses and severely diminish food production levels all over the world. To act upon the impacts caused by this group in an integrated and coordinated manner, it is needed to understand the diversity of alien lepidopterans and their global invasiveness patterns. To achieve this, we developed a global invasive lepidopteran species database. We gathered information available in scientific literature and existing regional (eg. USDA Invasive Species Database and APASD – Asian Pacific Alien Species Database) and pests (such as CABI Compendium and GRIIS – Global Register of Introduced and Invasive Species) databases. For each species indicated as non-native at a particular region we retrieved: the species identity, the region involved, the cause of arrival (intentional, natural dispersal from invaded regions or accidental/unknown), the year of the first recording and if a population is known to be established in that area. Our preliminary results allowed identifying over 200 non-native lepidopteran species, in over 300 regions across the world. The most dispersed species globally are among those considered agricultural pests – such as the fall army worm (*Spodoptera frugiperda*) or the South American tomato pinworm (*Tuta absoluta*). The number of species and introduction events reported for lepidopterans across the world is extremely high and the data is scattered across many distinct data sources, presenting strong challenges in the identification, assimilation and integration of these data, ultimately hindering efforts of global, integrated, analysis. This way, the invasive lepidopteran database we developed will be key for supporting future, international, invasion-prevention efforts of lepidopteran invasions and may also stimulate the development of similar databases for other problematic groups.

Session 5 – Conservation issues and biological invasions

TESTING COMPETITION MECHANISMS AND THE EFFECT OF HABITAT FRAGMENTATION ON *RUGULOPTERYX OKAMURAE* INVASION PROCESS

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The appearance of invasive alien species (IAS) in the oceans is a global phenomenon with serious ecological and economic consequences for the affected areas. Macroalgae are one of the most frequent groups of IAS and a dramatic case is what has been happening in recent years in the Strait of Gibraltar with the invasion of the alga *Rugulopteryx okamurae*. Throughout the coastal area of the Strait, it is causing significant environmental damage and serious economic losses, especially in the fishing and tourism sectors. Once established in new habitats, such as *R. okamurae* in the Strait, biological barriers within the host ecosystem, like competition, constrain their spread, influencing the invasion's scope and subsequent impacts, known as biotic resistance. Concurrently, the decline in biodiversity can aid invaders by creating conditions conducive to their expansion. Habitat loss and fragmentation, major anthropogenic stressors in marine ecosystems globally, exacerbate this vulnerability. Despite this, understanding the effects of fragmentation on marine ecosystems and its role in promoting IAS proliferation remains limited. This study seeks to evaluate the repercussions of fragmentation in marine systems and how the alteration of habitat structure might promote IAS spread, as well as its ecological consequences. Using intertidal rockpools as proxy system, both stressors were simultaneously manipulated to examine their effects on recruitment patterns, and macroalgae assemblages' invasibility. According to theory, fragmented habitats are expected to be more exposed to invasion, thus we hypothesize that fragmented assemblages would be more readily colonized by the invader compared to undisturbed ones. This research sheds light on biotic mechanisms, such as space competition, shaping resident community resilience against invasive expansions.

Session 2 – New tools and approaches for detection and monitoring

CHECKLIST OF THE NON-NATIVE VASCULAR FLORA OF CONTINENTAL ECUADOR

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Inventorying non-native species in continental Ecuador is still in its infancy. The only attempt to date to produce a list of non-native species for continental Ecuador is the one published in the Global Register of Introduced and Invasive Species database, reporting 737 alien species, of which 577 species were vascular plants. The aim of this study is to provide an up-to-date inventory of the non-native vascular flora of continental Ecuador. Our list reported 1253 non-native plants, 14 cryptogenic, and four regional non-native taxa in continental Ecuador, which doubles the number of taxa of non-native plants previously reported. This list was complemented with data on taxonomy, life-form, lifespan, biogeography, first record year, and spatial-temporal distribution. Among the total taxa, 61% (770) were cultivated (i.e., not having any record escaped from cultivation), 39% (497) were growing spontaneously, and 0.3% (n = 4) had an unknown status. The families with the highest number of non-native taxa growing spontaneously were Poaceae (19%, n = 81), Asteraceae (10%, n = 49), and Fabaceae (9%, n = 42). Most of non-native plant taxa in the wild (65%; n = 352) originated from Asia or/and Africa. Although the first record of a non-native wild plant in Ecuador was in 1799, the number of taxa introductions increased exponentially since 1910. The bioregion with the majority of taxa (65%, n = 325) was the Andes. We found reported uses in continental Ecuador for 79% (n = 392) of non-native taxa that occur in the wild; among these, the most frequent were ornamental (41%, n = 205), medicinal (39%, n = 191), and food crop (24%, n = 120) uses, which should be regarded as the main pathways of (intentional) introduction. Our results provide valuable insights for early detection, prioritization, and management of non-native vascular plants present in continental Ecuador.

Session 5 – Conservation issues and biological invasions

FIRST ASSESSMENT OF EUROPEAN EEL INFECTION BY *ANGUILLICOLA CRASSUS* IN MADEIRA ISLAND, MACARONESIA

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Infection of the European eel *Anguilla anguilla* with the nematode *Anguillicola crassus* is a classic case of how a non-native parasite can affect the fitness, survival, and reproduction of a new host. *A. crassus* develops on the swimbladder of the final hosts *Anguilla* sp., feeding on blood. Consequently, this nematode can compromise the hydrostatic capacity of the swimbladder, which is essential during the eel's spawning migration. Despite considerable efforts to investigate *A. Anguilla* infection by this parasite throughout this fish distribution range, there is a lack of knowledge for the Macaronesia region.

The occurrence of *A. crassus* was investigated in 19 female eels caught in three streams of Madeira Island. First, we hypothesised that this parasite is absent given that the main introductory event has never occurred in the region (i.e., eel trade). Second, we predicted that eels' physical condition would be higher than in regions with this parasite. The parasite presence was inspected, the swimbladder condition was estimated using the Swimbladder Degenerative Index, and Fulton's condition index was calculated. With a body condition between 0.15-0.24 (0.19 mean ± 0.03 SD), the swimbladder of all inspected eels presented a healthy appearance with no parasite, exudate, or other marks of parasitism.

Our results suggest that European eels inhabiting the inland waters of Madeira are not infected by this invasive nematode and, so, are in conditions to reach the breeding region in the Sargasso Sea. Findings support previous evidence that the eels' body mass and weight ratio is not correlated with infection by *A. crassus* since the physical condition was similar to those of eels in areas with the parasite. We urge more studies targeting the insular Macaronesia subpopulations of European eels and sympatric freshwater species that can equally host *A. crassus* to prevent this parasite's success in these particularly sensitive ecosystems.

Session 5 – Conservation issues and biological invasions, Session 6 - Pathways and dispersal of invasive species

FIRST CROSS-TAXA ASSESSMENT OF THE NON-INDIGENOUS BIODIVERSITY IN MADEIRA ARCHIPELAGO FRESHWATER SYSTEMS

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Non-indigenous species (NIS) are one of the major threats to biodiversity and ecosystem conservation. Worldwide, researchers and decision-makers have been working to prevent NIS hazards and mitigate their impacts. Nevertheless, these efforts have mainly been directed towards the mainland. This geographical bias leaves oceanic islands lagging in management plans, exacerbating the fragility of these ecosystems. In this context, we present a combination of recent studies carried out over the last three years on NIS in the freshwater ecosystems of Madeira Island. We focused on NIS recognised as successful invaders that may impact endemic communities (e.g., macroinvertebrates), the only native freshwater fish on the island (the critically endangered European eel *Anguilla anguilla*), and water quality. Specifically, we examined the presence and abundance of four species along the island: the New Zealand mudsnail *Potamopyrgus antipodarum* (which has a high grazing activity and is a potential prey for eels), the nematode *Anguillicola crassus* (which infects a wide array of hosts and is a major threat to eels in several mainland systems), the rainbow trout *Oncorhynchus mykiss* (a voracious fish and a potential competitor of eels), and the Muscovy duck *Cairina moschata* (responsible for eutrophication and a potential predator of eels). By identifying the freshwater NIS on the island, analysing their spatial distribution and related environmental conditions, we take a first step towards protecting Madeiran streams from biological invasions and their impacts.

Session 1 – Risk assessment and management of invasive species

PERSEVERANCE IS NEEDED – EFFICIENT LONG-TERM STRATEGY OF REYNOUTRIA MANAGEMENT

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The patterns of *Reynoutria* (Fallopia, knotweed) invasion under long-term chemical treatment was studied in The Morávka river floodplain, Czech Republic. The data covers 17 years of management which started with the European LIFE project. We focus on (i) assessment of *Reynoutria* distribution during long-term management, (ii) analysis of the change of distribution according to the habitat, and (iii) discussion of the optimal management strategy.

Distribution data was obtained using GNSS field mapping. Before the start of the management, *Reynoutria* stands covered 29% of the study area (96.9 ha). As a result of aerial spraying in 2007-2010, the extent decreased to 19.6% (65.3 ha) in 2009, and even reached 14.5% (48.2 ha) in 2013. Due to implementation of local management in the following years, the infested area was maintained at similar level, with minimum value 41.8 ha in 2018.

As a result of chemical treatments, there was a clear trend of fragmentation of larger polycormons into many smaller and less dense ones. The average size of *Reynoutria* stand decreased from 0.61 ha in 2007 to 0.15 ha in 2023. Testing of the effects of time, habitat and biotope did not reveal significant differences of changes of extent and abundance over different environments and indicates no differences in reaction to management in the studied habitat and vegetation types.

Based on the experience of the Morávka basin, we propose as a first step in largely infested sites to reduce the distribution of *Reynoutria* stands to isolated polycormons. This phase can last 3-5 years. Then we recommend herbicide application only in a period of every 3–5 years depending on the local context and rate of regrowth. At sites exposed to soil disturbances, where the soil is contaminated by fragments of Reynoutria rhizomes, herbicide should be applied immediately to target susceptible newly resprouting individuals.

Session 2 – New tools and approaches for detection and monitoring

HARMONISING INFORMATION ON BIOLOGICAL INVASIONS IN FEDERALLY MANAGED COUNTRIES – A STANDARDISED APPROACH TO FACILITATE GLOBAL BIOSECURITY

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Plant invasions are a major threat world-wide. In federally managed countries, alien species pose a more difficult challenge for management at the national scale, as information on invasions is provided by a collection of independent jurisdictions. This has led to inconsistencies in both, the terminology used to describe species invasion status at the national level, and the disparities on classification or status reported by each jurisdiction. This contrasting information impedes efficient management and biosecurity actions. To harmonise different information sources at the jurisdictional level into a national standard, we focused on Australia. We first proposed a terminology framework by combining invasion terms based on ecological- or policy-based criteria, with the former emphasising species' ability to overcome ecological barriers and the latter on species' impacts. We developed an R script that compares existing Australian data sources for vascular plant taxa (the Australian Plant Census, state and territory censuses, and the Australian GRIIS), identifies mismatches in definitions and records among them, and undergoes prioritisation procedures to tackle these mismatches. The information is then automatically integrated into a harmonised workflow at the national scale. This integration made possible the creation of a standardised dataset at the Australian national scale, the Alien Flora of Australia (AFA). The up-to-date information presented in the AFA can aid early warning of plant invasions, facilitate decision-making at different levels, and biosecurity at the national scale. The associated script is ready to be implemented into new versions of the AFA with updated releases of its data sources, streamlining future efforts to track alien flora across Australia. The script can also be modified to suit any other federally managed country, or to focus on fauna, ensuring interoperability of alien species data. Our harmonisation workflow alleviates the complex interplay that biosecurity regulations between different scales and among jurisdictions can involve.

Session 2 – New tools and approaches for detection and monitoring

TOWARDS INTEGRATING AND HARMONISING INFORMATION ON PLANT INVASIONS ACROSS FEDERALLY MANAGED COUNTRIES

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Terminology regarding the invasion status of alien species typically hinges on ecological- or policy-based criteria, with the former emphasizing species' ability to overcome ecological barriers and the latter focusing on their impacts. A universal consensus on invasion definitions remains elusive, hindering data synthesis from diverse sources. This issue is particularly challenging in federally managed countries like Australia, where biosecurity regulations span multiple jurisdictions.

To address Australia's plant census data stemming from independent jurisdictional sourcing, we developed a workflow. This process harmonizes terminologies across states and territories, identifying mismatches in definitions and records on invasion status for vascular plant taxa. Through our prioritization procedures, we integrate information into a national-scale harmonized workflow, resulting in the Alien Flora of Australia (AFA), a standardized dataset consolidating information from various sources.

The AFA, developed via an adaptable R script, compares data from the Australian Plant Census, state and territory censuses, and the Australian Global Registry for Introduced and Invasive Species, and resolves mismatches to establish unified invasion statuses. Following a unified taxonomy and terminology, the AFA provides updated information on plant introduction status and impact nationwide. Additionally, the associated script enables seamless integration of updated data sources into future AFA versions, ensuring continual efficacy in tracking alien flora.

This comprehensive dataset aids in early warning of alien species invasions, supports decision-making processes, and bolsters national-scale biosecurity efforts. Its adaptable script offers ongoing data integration, a valuable tool for maintaining effective alien flora monitoring nationwide. Furthermore, this workflow model can be tailored and extrapolated for use in any other federally managed country, to bridge the gap between federal and state biosecurity initiatives.

Session 3 – Global change and invasions

INVESTIGATING THE INVASION HISTORY AND POTENTIAL DISTRIBUTION OF *KALANCHOE XHOUGHTONII* AND ITS PARENTAL SPECIES (*K. DAIGREMONTIANA* AND *K. TUBIFLORA*)

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One of the major threats to global biodiversity is invasive alien species, with ornamental horticulture being the most significant introduction pathway. A good example is the 'mother of thousands,' *Kalanchoe xhoughtonii* D.B. Ward, a hybrid that until recently was thought to be exclusively the result of the artificial crossing between *K. daigremontiana* Raym.-Hamet & H. Perrier and *K. tubiflora* Eckl. & Zeyh. These parental species native to Madagascar, along with the hybrid, have established themselves in various regions worldwide. They are particularly invasive in dry or subtropical areas such as the Mediterranean Basin, Australia, the southern US and Mexico, and southern China. Their extensive use as ornamental and medicinal plants, coupled with their vigorous asexual reproduction, would have facilitated their spread.

To determine which of these taxa has the highest invasive potential, we have undertaken a comprehensive study to: (1) map their global distribution patterns, (2) trace their spatial and temporal colonization history, (3) predict their potential distribution under various climate change scenarios using ecological niche modelling, (4) compare their ecological niches, and (5) assess their invasive risk using the IUCN's Environmental Impact Classification for Alien Taxa (EICAT).

Session 1 – Risk assessment and management of invasive species

FROM INVASIVES TO ECO-PRODUCTS: DANUBECARE'S STRATEGY AGAINST THE INVASIVE SPINY-CHEEK CRAYFISH

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The spiny-cheek crayfish, *Faxonius limosus*, is a native species of Eastern and North America that has been introduced to Europe. Nowadays, this species is found in more than 20 European countries and is listed as an Invasive Alien Species (IAS) of Union concern. The first record of *F. limosus* in Serbia was in the Danube River near Apatin in 2002. Given the available data and the high dispersal rate of this species, its invasive range in Serbia is more extensive than documented, with a tendency for a high degree of expansion in the future. Since this species is one of the most critical aquatic invaders in European inland waters, there is an urgent need to address the problem of its impact on biodiversity. The DANUBEcare project ("Reducing the negative impact of invasive crayfish *F. limosus* in the Danube by smart exploitation of their meat and shells"), funded by the Science Fund of the Republic of Serbia, aims to manage the spiny-cheek crayfish by transforming this invasive species into a variety of eco-products, aligning with the concept ZERO WASTE. These eco-products include food for human/pet consumption made from spiny-cheek crayfish meat, while crayfish shell will be used as an adsorbent for removing heavy metal ions from wastewater, rubber bio-filler, and chitosan-based biomaterials for packaging application. The DANUBEcare project represents state-of-the-art research and innovation that may be applicable to other IAS. Moreover, the DANUBEcare project includes several actions aiming to familiarize and promote citizen-scientists through their role as consumers for sensory evaluation of newly developed food products, surveys, and use of the "Invasive Alien Species in Europe" Web App, which allows citizens to report sightings of IAS of Union Concern.

This research was supported by the Science Fund of the Republic of Serbia, GRANT No.7417. "Reducing the negative impact of invasive crayfish F. limosus in the Danube by smart exploitation of their meat and shells", DANUBEcare

Session 6 – Pathways and dispersal of invasive species

FIRST RECORD OF THE SEMI-AQUATIC INVASIVE PLANT *CRASSULA HELMSII* IN THE IBERIAN PENINSULA AND ITS LINK TO POTENTIAL DISPERSAL DRIVERS

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Aquatic neophytes are among the most harmful invasive species worldwide. Here we report the finding of the semi-aquatic invasive plant *Crassula helmsii*, naturalized in a freshwater reservoir that provides water to the large city of A Coruña, NW Spain. To better understand the extent and potential environmental correlates of *C. helmsii* invasion, we recorded the presence and frequency of *C. helmsii* in its emerged and floating mat forms at twelve sampling sites along the reservoir margins, and characterized the soil characteristics, plant community and environmental factors. *Crassula helmsii* is dispersed by fragmentation of the stems, potentially aided through shredding by local fauna such as the invasive crayfish *Procambarus clarkii*. We hypothesize that this could be a case of an invasional meltdown, when multiple invasive species facilitate one another and have synergistic effects on native ecosystems. The emerged form of *C. helmsii* was found in ten out of twelve sites with a mean cover value of 9.8 ± 10.4% (mean ± SD). We found no correlation between frequency of the emerged form of *C. helmsii* and abundance of *P. clarkii*, but frequency of the emerged form of *C. helmsii* increased with higher soil nitrogen and vascular plant richness. We outline emergency actions for management of *C. helmsii* at this stage of the invasion, focusing on containment and avoiding spread to nearby water bodies.

Session 1 – Risk assessment and management of invasive species

DO ALIEN AND NATIVE WOODY SPECIES DIFFER IN THEIR IMPACT ON VEGETATION AND SOIL?

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Understanding the impact of alien species on ecosystems is a necessary condition for setting management priorities. Using the same methods, we studied the impact of 12 alien and 11 native woody species on vegetation and soil, namely nutrient availability and litter decomposition. The species selected for the study are trees or shrubs known for their negative or potential impact and dominate the communities they invade, such as aliens *Ailanthus altissima*, *Robinia pseudoacacia*, and *Prunus serotina* and natives *Quercus robur*, *Acer platanoide*s and Prunus spinosa. The focus of the study was on a large geographical scale (Czech Republic, Poland, Slovak Republic).

We present results for woody species based on two-year sampling of the vegetation and one-year season of soil and leaf litter analyses. In addition, we compare these results with those from our previous project that addressed the impacts of alien and native dominant herbaceous plants. For herbaceous species, the impact did not systematically differ among native and alien dominants. However, we recorded for several pairs of species occurring in the same habitats significant differences in impact on vegetation and soil (Hejda et al. 2021, Pergl et al. 2023).

Hejda M et al. (2021) Impact of invasive and native dominants on species richness and diversity of plant communities Preslia 93: 181–201 doi: 10 23855/preslia 2021 181

Pergl J et al. (2023) Plant-soil interactions in the communities dominated by alien and native plants. PPEES 59: 125721. doi: 10.1016/j.ppees.2023.125721

Session 6 – Pathways and dispersal of invasive species

EVALUATION OF THE RISKS OF RECREATIONAL ANGLING ON INVASIVE ALIEN SPECIES SPREAD: RESULTS OF A SURVEY IN BELGIUM

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Aquatic ecosystems are one of the most impacted ecosystems by biological invasions. They seem to be more susceptible to invasions and subsequent environmental alterations than their terrestrial counterparts. Moreover, eradication of invasive species in these systems proves to be very challenging. It is therefore crucial to prevent new introductions and secondary spread of species already present through a collective effort of all water users. The adoption of biosecurity measures is an efficient way of decreasing unintentional transportation of IAS plant fragments or larvae on equipment due to recreational or professional freshwater activities.

To inform the development of the first biosecurity campaign for Belgian anglers, a national online survey for anglers was organized during the spring of 2023, and generated more than 3000 individual replies. The aim of this survey was manyfold: gain a better understanding of angler mobility and angling frequency, assess current routines of equipment maintenance and bait disposal and also assess anglers' awareness and perception on the issue of biological invasions.

Results indicated that there is a real risk that anglers can introduce IAS in uninvaded systems either by unintentionally moving organisms around by changing locations during one trip (25% of anglers) or by bringing them back from abroad (45% of anglers). This is especially true since only 7% of anglers adhere to the full check-clean-dry routine after each trip, and mobile anglers were not more proficient at cleaning their equipment. Additionally, some anglers sometimes release bait or undesired species to another location. Respondents' perception on IAS was rather negative, with anglers citing them amongst the three main threats for angling – indicating they could be considered as allies in the fight against IAS.

The results of the survey inform our future work with the angling community in Belgium to design adequate messages, efficiently reach the target audience and assess after if the campaign had an influence on angler habits and awareness.

Session 3 – Global change and invasion

WELCOME TO THE JUNGLE: ALIEN AND CRYPTOGENIC BRYOZOANS ASSOCIATED WITH FLOATING PONTOONS OVERCOME NATIVES IN RECREATIONAL MARINAS OF NORTH PORTUGAL

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Anthropogenic structures such as marinas are heavily impacting shoreline ecosystems by changing original environmental conditions. In recreational marinas, floating pontoons and piles increase substrate availability, fostering rapid colonization by fouling species. Thus, recreational marinas are important pathways for the introduction and secondary spread of non-indigenous species (NIS). Bryozoans are a common phylum on fouling assemblages and several NIS of this group are known to be transported due to recreational boating. In fact, previous studies have found great abundances of NIS bryozoans in recreational marinas. As part of the project 'Marina-Forests' (http://doi.org/10.54499/2022.06806.PTDC), fouling animals associated with floating pontoons were studied in 3 recreational marinas of North Portugal. A total of 161 taxa belonging to 11 phyla were found, of which 13 species (8.07%) were bryozoans. Among them, Cheilostomatida were the most diverse group with 9 species (69.23%) whereas the remaining 4 species belong to Ctenostomatida (30.77%). Of the latter, 3 species are native and one is considered cryptogenic (20%): *Amathia gracillima* (Hincks, 1877). Among the 9 species of Cheilostomatida, 3 are regarded as cryptogenic (33.33%): *Bugulina fulva* (Ryland, 1960), *B. stolonifera* (Ryland, 1960) and *Cryptosula pallasiana* (Moll, 1803); while another 3 (33.33%) are considered as alien: *Bugula neritina* (Linnaeus, 1758), *Tricellaria inopinata* d'Hondt & Occhipinti Ambrogi, 1985 and *Watersipora subatra* (Ortmann, 1890). The remaining 3 cheilostomatid species are native. Therefore, from the 13 bryozoan species found, 6 are native (46.15%), 4 are cryptogenic (30.77%) and 3 alien (23.08%). Considering the latter two categories together, alien and cryptogenic bryozoans associated with floating pontoons overcome native ones in the studied marinas. The control of NIS bryozoan abundance in marinas may limit their spillover into natural rocky habitats where they can interact with native communities. Therefore, our results should be considered to develop NIS monitoring programs.

Session 5 – Conservation issues and biological invasions

SEED ENDOPHYTES FROM NATIVE AND INVASIVE FABACEAE: IS THERE A CLEAR DISTINCTION?

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The presence of alien invasive plant species poses a threat to ecosystems, as it diminishes local biodiversity and disrupts ecosystems' functioning. Portuguese native flora has been coexisting with invasive plants for many years. Recent research indicates that seed endophytes significantly contribute to invasive potential by facilitating germination and early seedling growth of invasive species. In this sense, the present study aimed to compare microbial seed endophytes in native and invasive Fabaceae living in close vicinity, from two different habitats in Portugal: a dune in Península de Setúbal and a forest in Serra de Sintra. Seeds of the native species *Erophaca baetica*, *Genista triacanthos*, *Retama monosperma*, *Stauracanthus genistoides* and *Ulex jussiaei*, and the invasive species *Acacia melanoxylon* and *A. saligna* were collected. Bacteria and fungi were isolated through classical microbiology, followed by the 16S rRNA and ITS regions sequencing for identification. In addition, the most relevant functional traits were inferred at species level, through bioinformatic analysis using FAPROTAX and FungalTraits. A total of 150 isolates were identified (99 bacterial and 51 fungal isolates), and the most frequent bacterial and fungal genera isolated were *Bacillus* and *Penicillium*, respectively. Dune and forest were segregated considering seed endophytes, and microbial communities were shared between invasive and native plants in each habitat. However, functional traits were more diverse in invasive species, especially for bacteria. Fungi presented functions complementary to bacteria in all plant species. Altogether, this microbiome potentially fulfils plant needs. This study reinforces the ability of Acacia in gathering beneficial endophytes into their seeds, which can be a key factor when entering a new environment, helping its ability to thrive.

Session 3 – Global change and invasions

SOIL, ROOT-NODULES AND SEEDS - THE DYNAMICS OF THE ACACIA MICROBIOME: WHERE AND WHEN

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Microorganisms play a key role in soils by performing several activities that keep functionality and health. By interacting with plants, they promote their overall fitness, which could facilitate adaptation under climate change scenario, ultimately triggering biological invasions. In this sense, plant-microbe interactions provide an opportunity to understand an ongoing response to a changing environment. *Acacia longifolia* is one of the most relevant invasive species worldwide, and a good model for studying adaptation and invasion success. As a Fabaceae, this species establishes symbiosis with rhizobia (i.e., nitrogen-fixing bacteria) in newly formed root structures called nodules, which are a source of fixed nitrogen. Previous research has confirmed promiscuity in symbionts' recruitment, extending it to the presence of fungi and raising the question of a potential multifunctionality of root-nodules. Also, because acacias are well adapted to harsh conditions, to which extent nodulation has a seasonal and dynamic microbial community is yet to be revealed. In this study, we compared two contrasting habitats (Dune and Forest) from 3 distinct locations from North to South of Portugal (Mira, Fonte da Telha and Vila Nova de Mil Fontes) and, assessed microbial diversity through Next Generation Sequencing targeting 16S rRNA region and ITS, in soil, root-nodules and seeds. Considering the interaction plant-microorganisms is a key process for an efficient adaptation, our main objective was to find out whether there is i) a site-specific signature allowing acacias to adapt and recruit the available microbial partners; ii) a seasonality inside root-nodules communities with an exchange of partners throughout time; and iii) a distinct microbiome in soils, root-nodules and seeds, increasing the odds of a multifunctional community. This study disentangles the promiscuity of A. longifolia in recruiting its partners, not only considering where – spatial scale, but also when – temporal scale.

Session 2 – New tools and approaches for detection and monitoring

GLOBAL CROSS-TAXA FUNCTIONAL AND PHYLOGENETIC DIVERSITY ACROSS AN INVASIBILITY GRADIENT

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To become invasive, a species must first be transported, then introduced in a new environment, establish and spread. Transport and introduction are often driven by human demand, as IAS geographic patterns follow human trade and transport. But invasion success also depends on ecosystem, alien and native species characteristics. According to Elton's diversity–invasibility hypothesis, invasion is less successful in diverse native communities, while Darwin's naturalization hypothesis suggests IAS are more successful if they are phylogenetically distant from native species, reflecting niche differences. We aim to assess if FD/PD or phylogenetic closeness between alien species and recipient communities explain regional invasibility, and how FD/PD are affected by terrestrial vertebrate invasions worldwide.

Session 1 – Risk assessment and management of invasive species

SPATIAL RISK ESTIMATION OF NON-NATIVE SPECIES PROLIFERATION FROM MARITIME INFRASTRUCTURES TO NEIGHBORING HABITATS

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The proliferation and increase of non-native species in maritime infrastructures has captured the attention of researchers, managers, conservation agencies and other stakeholders. As they are primers for biological invasions, monitoring and surveillance is key for the early detection of new non-native species, whereas taxa invasiveness risk assessments can help identifying concerning species. Despite the growing number of monitoring programs and efforts to assess non-native establishment and proliferation there is still a lack of solutions to assess and/or predict how non-native species present in maritime infrastructures can locally proliferate to surrounding habitats. Many of the current research and monitoring efforts target maritime infrastructures such as ports, harbours and marinas. These targeted efforts are mostly because these infrastructures are widely acknowledged as hotspots for non-native species, as they host numerous vessels travelling from different geographic locations that can act as vectors of introduction. Long term monitoring is quite demanding, more so outside of these easily accessible hotspots, which leads to a lack of studies and assessments of the likelihood of non-native species detected inside a maritime infrastructure to locally expand its distribution and proliferate in the surrounding habitats. Here we explore the development of spatially explicit indexes that can be used to assess/predict the risk of non-native species to expand beyond ports and marinas based on distance, marine traffic, number and traits of non-native taxa. The goal is to provide relative risk assessments, based on best available knowledge, to identify areas vulnerable to the local proliferation of general or specific non-native species which can be used on its own or integrated in more sophisticated habitat suitability models.

Session 1 – Risk assessment and management of invasive species

MARITIME TRADE AND BIOLOGICAL INVASIONS MANAGEMENT: A SEAPORT PLATFORM OF ENVIRONMENTAL SURVEILLANCE IN COTONOU, BENIN, AS A PILOT MULTI-STAKEHOLDER INITIATIVE

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Maritime trade is known to be a key driver of bioinvasions which are considered as one of the leading causes of biodiversity erosion, worldwide dissemination of pests for crops and food stocks as well as pathogen reservoirs introduction route. Unfortunately, there is a lack of collective multi-stakeholder public-private viable economic model to fund durably Invasive Allien Species surveillance and control. Here we present the first Seaport Platform for Environmental Surveillance (PPSE, or Plateforme Portuaire de Surveillance Environnementale in French) in Cotonou, Bénin which consists in a lab where a panel of Seaport Environment Service staffs and academics implement field surveys and experimental analyses that aim at monitoring invasive pest organisms within the seaport area, particularly: rodents and their associated zoonotic pathogens, food stock-damaging insects, human pathogen-vectoring mosquitoes and zooplanktonic organisms. To our knowledge, the PPSE is the first laboratory dedicated to the monitoring and management of invasive species to be built inside the walls of an African seaport. As an emblematic initiative of sustainability science, it holds both promises and challenges. First, it has succeeded in seating different stakeholders around the same table (seaport staff as well as handling and import/export companies; representatives of ministries and other national services; researchers and students). Second, from now on, it contributes to boost communication about bio-invasions and their socio-environmental consequences in Benin through various national and international media, is an important achievement on its own. Third, it has already allowed to highlight several potential recent bio-invaders in Benin, such as the house mouse, the Brown rat-borne Seoul Ortohantavirus, a quarantine crop-damaging beetle as well as several zooplanktonic species followed by appropriate management measures. We believe that the PPSE is an innovative science-guided operational initiative that may be useful to replicate in other settings throughout the world.

Session 3 – Global change and invasions

IMPACTS OF CLIMATE CHANGE ON SECONDARY GROWTH OF A NATIVE AND AN EXOTIC PHYLOGENETICALLY RELATED TREE SPECIES IN SPAIN

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Climate change and anthropogenic introduction of potentially invasive species are two of the main drivers of global change. To better understand the influence of climate change on the exotic species performance, the secondary growth of two phylogenetically related tree species was compared: a native elm (*Ulmus minor*) and an exotic elm species (*Ulmus pumila*) in Spain. Dendroecological techniques were used to measure the basal area increment (BAI) of both species to compare temporal trends from 1996 to 2021. Additionally, the correlation coefficients of earlywood, latewood, and ring width with seasonal climatic variables were calculated. Results show that the exotic elm presents a slightly higher BAI than the native one. Both species exhibit higher growth rates as they age, and competition did not play a significant role in growth. In general, the growth of the exotic elm was more responsive to seasonal climatic variables. Despite these slight differences, results suggest that both species could be affected by climate change, although with varying degrees of severity.

Session 6 – Pathways and dispersal of invasive species

EXOTIC WEEDS: SOUTH AFRICAN PLANTS IN MEXICO

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Mexico has registered about 700 species of introduced higher plants, primarily originating from the Old World, with several from Africa. They probably migrated via Spain or South America. This study focused on weeds from South Africa and neighboring regions in Mexico. Despite the geographical distance, both countries share common traits, such as their subtropical location, similar climates and a rich diversity of native species; they also have a relatively well-documented flora. Despite the historical lack of direct contact between Mexico and South Africa, species from Africa have established themselves in Mexico and have not been systematically documented until now. A comprehensive review was conducted across various databases to identify South African species present in Mexico as wild-growing plants, followed by corroborating their native range using available bibliographic sources. Information on the habit, life cycle, uses, and estimated arrival dates of South African species was recorded, the latter supported by data from different herbaria. Forty-four species from South Africa belonging to 14 families were identified, with the Poaceae family representing 58%. Among these, 21 have been established in Mexico for 70 years or more, whereas five species have herbarium records of less than 25 years. Perennial herbs and grasses were dominant over annuals, with only one shrub and no tree species. Documented uses were found for 88% of the species, primarily as fodder and ornamental plants. Few food or medicinal species migrated. This use distribution suggests commercial interests as the main filter. Understanding the floristic exchange between specific world regions helps to understand and predict invasion processes.

Session 6 – Pathways and dispersal of invasive species

TRACKING THE INVASION OF *CINARA CURVIPES* (HEMIPTERA, APHIDIDAE) IN EUROPE: CITIZEN SCIENCE, 'CHRISTMAS TREE' TRADE, AND ECOSYSTEM IMPACTS

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Nearctic species, the bow-legged fir aphid Cinara curvipes, was first recorded in Europe at the RBG, Kew, UK, in the early 21st century. Over the subsequent two decades, it expanded its range to various locations across continental Europe, including Germany 2001, Serbia 2002, Switzerland 2007, Czech Republic 2007, Slovakia 2007, Slovenia 2009, Bulgaria 2009, Hungary 2013, Austria 2014, Poland 2015, Turkey 2015. While its primary hosts are firs, it can also infest cedars, *Douglas fir*, and western hemlock. Characterized by a flexible reproductive strategy, *C. curvipes* rapidly forms outbreak populations, leading to significant overpopulations observed in Germany (2001) and the Czech Republic (2007). Reports on widespread mass occurences of *C. curvipes* in Poland emerged in May 2020. Colonization primarily affected various fir species in private properties, parks, and botanical gardens, with aphids occupying the underside of branches, trunks, and neighboring building facades. These observations prompted collaboration among scientists, foresters, and citizens, leading to the dissemination of information through online databases, social media, and institutional letters. Similar instances occurred in Norway in 2022, where citizen observations facilitated the identification of *C. curvipes*, marking the northernmost location of this species in its introduced range. Furthermore, the expansion of the bow-legged fir aphid in Europe has been influenced by the trade of Christmas trees, with infected trees potentially serving as vectors for inadvertent spread to new regions. This was exemplified by the detection of *C. curvipes* on Nordmann Fir imported as 'Christmas trees' from Denmark to Norway in November 2022, highlighting the 'Christmas tree' trade's potential role in the international spread of this species. Moreover, the bow-legged fir aphid was initially documented in Denmark (2002) within a 'Christmas tree' plantation. Therefore, the spread of *C. curvipes* in Europe requires collaborative monitoring and management among researchers, growers, and the public.

Session 6 – Pathways and dispersal of invasive species

INVESTIGATING THE EXPANSION OF AN ALIEN AND POTENTIALLY INVASIVE HARDY-BAMBOO APHID SPECIES *TAKECALLIS NIGROANTENNATUS* (HEMIPTERA, APHIDIDAE): INSIGHTS FROM BOTANIC GARDENS, NURSERIES, AND GARDEN CENTERS

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The introduction and establishment of alien insects' species are believed to be facilitated by various factors, including globalization, international trade, and climate change. Among aphids, an example is the newly described hardy-bamboo aphid species *Takecallis nigroantennatus* Wieczorek. In 2023, this species was recorded in one location in the Central Pomerania region, and in the subsequent year, in two other locations in Wielkopolskie Voivodeship. These were the first records of a representative of the oriental genus *Takecallis* associated with Bambusoideae in Poland. The localities of this species are also known in the southern part of the UK, where it was initially misidentified as a different species as early as 2015. *T. nigroantennatus* is mostly associated with the cold-hardy bamboo variety *Fargesia* spp., and occasionally with *Phyllostachys* spp. The species' presence in Europe, though not yet found in its natural range, suggests a connection with the introduction of frost-resistant bamboo from China. According to our research conducted in Poland, Belgium, UK and the Netherlands, the mentioned species occurred both in botanic gardens (Meise Botanic Garden, Belgium; the Royal Botanic Gardens in Edinburgh, Benmore and Logan, UK), specialised bamboo nurseries (the Bamboo Nursery Kimmei, the Netherlands), garden centers and even local flower shops (Poland). In botanic gardens, where host plants are readily available, populations of the studied species are likely established, likewise, population in the specialized Bamboo Nursery Kimmei. Conversely, garden centers appear to serve as sources for the spread of bamboo aphid species. The dense aggregation of various varietes facilitates rapid colonization of neighbouring plants by aphids, known as the "hop on, hop off" effect. Thus, human-mediated activities, particularly the transportation of infested plants, contribute to the spread of this insect into new areas, emphasizing the need for collaboration between researchers, nurseries, and garden centers to mitigate its expansion.

Session 5 – Conservation issues and biological invasions

GOOD PRACTICES AND NEW CHALLENGES IN THE PROTECTION OF ECOSYSTEMS AGAINST INVASIVE ALIEN PLANTS IN SOUTHERN POLAND – THE PROJECT IAS/ECOSYSTEMCARE

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The overarching goal of the Project entitled Integrated approach to ecosystems protection against invasive alien species of plants in southern Poland – IAS/EcoSystemCARE was to strengthen the resilience of selected ecosystems, primarily riparian and terrestrial ecosystems through their comprehensive protection against invasive alien species of plants (IAS-P).
Based on the assessment of risks associated with the spread of IAS-P in selected areas of southern Poland, the activities included 2 national parks, 4 Natura 2000 sites, 2 nature reserves, 2 ecological sites, and unprotected areas located in 7 municipalities. We focused on the following invasive species found in the Project area: Caucasian hogweeds, Himalayan Balsam, knotweeds, and species from the genus goldenrod.
To develop model solutions to the problem, several tasks have been performed to remove or control IAS-P in the indicated ecosystems, using both traditional and innovative methods which, where they have proved successful, will provide a new approach that can be implemented in similar areas.
The Project has developed a methodology for early detection of Caucasian hogweeds sites using UAVs, a key element in effectively controlling them at an early stage of invasion. Moreover, in the ecosystems, in the designated protected areas covered by the Project, potential sources of spread of IAS-P propagules were defined and possible pathways of their introduction were identified. This knowledge can form the basis for developing recommendations to prevent the spread of IAS-P into protected areas, such as national parks or Natura 2000 sites, and implementing good practices in this regard. We assume that the Project has significantly contributed to the dissemination of knowledge and raising public awareness of IAS-P, through the implementation of various training and educational activities.
The Project was implemented and co-financed under the "Environment, Energy and Climate Change" Programme EEA Financial Mechanism 2014-2021.

Session 1 – Risk assessment and management of invasive species

NEW INSIGHTS INTO THE POPULATION ECOLOGY OF KNOTWEEDS

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Understanding the processes that underpin the invasive spread of exotic species is critical for enhancing the efficacy of management strategies. The dissemination dynamics depend on reproduction strategies, population structure and offspring establishment. Knotweeds (*Reynoutria* spp.) are notoriously known invasive plants with a predominantly vegetative mode of reproduction. Recently, generative reproduction has become increasingly common, and various interspecific hybrids are present in the wild. This synthetic study focuses on detecting genetic variability, hybridisation, and polyploidisation within the *Reynoutria genus*, including identifying generative reproduction limits. European knotweed populations, including France, Germany, Croatia, and the Czech Republic, were sampled to assess their cytological and genetic composition. Seeds collected from different mother plants across Europe underwent germination experiments, and the resulting seedlings were cultivated in natural and controlled environments. Flow cytometry was employed for cytological analyses, and SSR markers were utilised to assess genetic diversity. Distinct evolutionary processes were observed across European populations, and population structure is strongly influenced by local conditions and the presence of specific taxa/cytotypes. The study detects common hybrid crossing scenarios, where the octoploid progeny exhibit evolutionary promise primarily due to their capability for successful backcrossing with *R. japonica*. No genetic or cytological limits to hybridisation have been found. The most significant outcome is the discovery and the first undeniable documentation of genetic variability in *F. japonica*. Riparian habitats were found to be favourable for germination, seedling establishment, and the potential environment where evolutionary changes occur. Therefore, it is necessary to implement taxa-specific management to prevent seed production and the emergence and spread of new clones from seedlings, primarily along riverbanks.

Session 3 – Global change and invasions

GREEN CRAB (*CARCINUS MAENAS*) POPULATION FLUCTUATIONS ON THE MAGDALEN ISLANDS (QUÉBEC, CANADA)

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Biological invasions represent one of the major threats to biodiversity and ecosystem health and functioning. The green crab (*Carcinus maenas*), a hugely successful invader worldwide, has huge and concerning documented impacts on native ecosystems around the world, and currently represents a major threat for fisheries, biodiversity and ecosystem functioning in many regions. In eastern Canada, the green crab is abundant and widespread in Nova Scotia and southern New Brunswick, but has heretofore been largely absent from Québec due to waters being too cold. The Magdalen Islands, however, had a population that was first detected in 2004, with numbers subsequently increasing from 2008 through 2012. In 2013, numbers fell and by 2015 only a few individuals were detected. Numbers remained low through 2022, but 2023 has seen a significant increase. Cohort analysis indicates that years with longer periods above 10°C were correlated with population increases while colder winters occurred when numbers fell. Implications of currently increasing temperatures in the waters of Québec for the establishment and future spread of green crab both on the Magdalen Islands and in the Baie des Chaleurs are discussed with implications for coastal habitats and ecosystems.

Session 3 – Global change and invasions

EXPLORING CO-INVASION DYNAMICS: PARASITIC INTERACTIONS IN THE WAKE OF NILE PERCH INVASION IN LAKE VICTORIA AND ITS IMPACT ON THE PARASITE FAUNA OF HAPLOCHROMINE CICHLIDS

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Biological invasions represent a significant threat to global biodiversity, impacting ecosystems and altering ecological dynamics. The introduction of the Nile perch (*Lates niloticus*) into Lake Victoria (East Africa), has led to ecological transformations, influencing the native fish communities. While much attention has been devoted to studying the ecological impacts of the Nile perch invasion on the native fish fauna and socio-economic consequences, little is known about the co-introduction dynamics of its potentially co-invasive parasites, as well as the impact on the gill macroparasite fauna of the native fishes impacted by the invasion (e.g. haplochromine cichlids).

To investigate the co-introduction dynamics, we assessed the genetic and morphological diversity of *Dolicirroplectanum lacustre*, the only flatworm (Monogenea) parasite that infects lates perches across Africa. We found that *D. lacustre* was co-introduced with *L. niloticus*. In Lake Victoria, we found a reduction in the genetic and morphological diversity of *D. lacustre* compared with its native range, indicating a founder effect. To examine the broader ecological consequences of Nile perch invasion and human-induced eutrophication, we compared gill macroparasite communities of 13 native haplochromine cichlid species before and after these perturbations. We observed a reconfiguration of the host-parasite network that buffers the impacts of perturbations, indicating resilience. However, we observe a decrease in parasite-host range and infection parameters, highlighting the vulnerability of parasite communities to ongoing environmental changes associated with biological invasions.

These findings underscore the importance of understanding the intricate dynamics of host-parasite interactions in the context of biological invasions and environmental change. By integrating insights from the invasive species dynamics and ecological perturbations, we provide valuable insights into the challenges and opportunities for conservation efforts to preserve ecosystem health and resilience in the face of global change.

Session 2 – New tools and approaches for detection and monitoring

A CITIZEN SCIENCE ENDEAVOUR: CHANGING THE PLIGHT OF A CRITICALLY ENDANGERED NATIVE FRESHWATER FISH, THE CRUCIAN CARP IN THE CZECH REPUBLIC

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The citizen science approach helps to gather relevant ecological data with high coverage and reduces time and cost to solve intriguing conservation issues. Native crucian carp (*Carassius carassius*) has encountered a sharp population decline in central Europe and is currently critically endangered in the Czech Republic, prompting conservation measures. Thus, the citizen science project "Save the Crucian Carp" has been started to map current distribution, conserve, and restore it. We aimed to analyse the effectiveness of this project which recorded the current and historical distribution of the crucian carp and the invasive gibel carp (*Carassius gibelio*), which is largely behind this decline. A total of 953 citizens provided information on the species distribution and details of occurrence. We summarized this dataset for the success of tips, citizens' emotional attitudes towards conservation, and how outreach activities increase citizen participation. A comparison with the National Conservation Agency dataset was also carried out. The success rate of respondents' tips after verification was 35% for crucian carp. A positive correlation was observed between respondents' species identification quiz scores and the number of tips they provided. Respondents between the ages of 30 and 50 responded more positively to conservation efforts than other age groups. The increase in citizen participation associated with the dissemination of information through public media underscores the importance of conservation awareness for the success of citizen science endeavours. This project is currently making a significant contribution towards conservation and can promote this approach for the conservation of other freshwater species worldwide.

Session 6 – Pathways and dispersal of invasive species

PRUNUS SEROTINA AS AN EMERGING INVASIVE SPECIES IN THE CZECH REPUBLIC

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Prunus serotina is among the 40 most invasive tree species globally and has a significant impact on the environment as well as on the economy (forestry). It is a rapidly emerging species in the Czech Republic, while it is already widely distributed in surrounding countries. Its spread has been aided by the large scale of planting in disturbed areas. For example, black cherry was often planted as an ameliorative tree on landfill and ash sites. In our study, we present the results of comparing the impact of invasive species on vegetation and soil to that of native dominant trees and shrubs. We also map new occurrences due to citizen science in the project at platform iNaturalist. Even though *P. serotina* is already widespread in neighboring countries; therefore, complete eradication of this species is no longer realistic; it is necessary not to resign and try to slow down its spread in the Czech Republic as much as possible. Early detection of this species in forests is urgently needed, followed by rapid management. Once highly resprouting alien woody species become established on a large scale, they are extremely difficult to eradicate. Therefore, preventive measures are crucial to minimize the financial resources required for subsequent eradication.

Session 6 – Pathways and dispersal of invasive species

BIOTIC INTERACTIONS MORE THAN ABIOTIC CONDITIONS DETERMINE THE INVASION SUCCESS OF *SENECIO INAEQUIDENS* IN AN INVASIVE RANGE

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Understanding the processes driving the establishment and spread of invasive alien species is crucial to predict their impacts and to design effective management strategies. Yet, the highly context-dependent nature of invasion dynamics makes it challenging to disentangle the effects of abiotic and biotic factors in driving the invasion success. In this study, we used the invasive alien Senecio inaequidens DC. (South African ragwort) as a study case to investigate the interplay between abiotic and biotic factors in influencing its invasion success in N-Italy. To this aim, through field surveys across three semi-natural habitats, we assessed with linear mixed models the relative importance of resident communities' diversity, functional and phylogenetic similarity to the target alien, and soil main characteristics (phosphorus and nitrogen content, surface stoniness and grain size), in influencing the abundance and performance of *S. inaequidens* in terms of plant height, SLA, and floral production. Results showed a stronger effect of biotic interactions over abiotic conditions in determining the success of *S. inaequidens*, mainly explained by resident species' diversity and cover which higher values decreased the target alien cover and fitness. However, when analysing the similarity patterns between *S. inaequidens* and the resident communities, we found an opposite relationship, indicating a better performance of the alien when growing with more similar species. Abiotic factors had only marginal effects on influencing the strength and direction of biotic interactions, and partially showed a stronger biotic resistance, in terms of resident species richness, in more benign abiotic conditions (in less disturbed and stressed habitats with higher soil nutrient concentration). Our findings shed light on the factors promoting the spread of *S. inaequidens* in our study system, and on the need to consider diverse ecological mechanisms underlying taxonomic, phylogenetic and functional diversity, together with the abiotic context, when analysing the invasion process.

Session 3 – Global change and invasions

ALIEN PLANT INVASION: ARE THEY STRICTLY NATURE'S ENEMY AND HOW CAN WE USE THEIR SUPREMACY?

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Invasion of plant species has been considered as one of the most dangerous forces in bio-diversity changes and alteration of soil properties. Due to their significant impacts on ecology and the economy, it is important to find an effective approach to manage the invasive plants expansion and utilize them as beneficial biomass sources. This review focuses on the characterization of the negative and positive features of invasive plant species in general. Most studies targeted on invasive species removal and lacked an evaluation of their potentials in modern biotechnologies. Currently, there are studies aimed at their use in soil remediation, medicine, the chemical industry, the textile industry, and even gastronomy. Based on these reviews, we bring forward possible future development in this research field, which might serve as a theoretical premise for further research.
This research was funded by Slovak Scientific Agency VEGA No. 1/0213/22 and Slovak Research and Development Agency APVV-20-0140.

Session 5 – Conservation issues and biological invasions

EVALUATION OF MICROBIOLOGICAL SOIL CHARACTERISTICS UNDER THE INFLUENCE OF SELECTED INVASIVE PLANT SPECIES (*FALLOPIA JAPONICA AND SOLIDAGO GIGANTEA*)

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This study was devoted to the evaluation of microbiological soil characteristics - enzymatic activity from container experiments of selected invasive plant species (*Fallopia japonica* and *Solidago gigantea*). Stems, leaves, and flowers were used to produce organic matter for container experiments. Plant biomass was collected in Eastern Slovakia in the vicinity of the Ružín water reservoir in September 2020. Plant biomass was decomposed in plastic composters, in the process of cold composting, for two years. The container trial consisted of five types arranged in five repetitions over a period of five months (May to September). The 25 containers consisted of a) soil, b) 50% soil and 50% *F. japonica* organic matter, c) 50% soil and 50% organic matter of *S. gigantea*, d) 100% organic matter of *F. japonica*, and d) 100% organic matter of *S. gigantea*. In total, 125 containers (2.5 l) were prepared. Samples were collected each month from May to September 2022. The aim of this study was to determine the microbial parameters affecting the quality and health of soil ecosystems (β-glucosidase, FDA hydrolase, acid, and alkaline phosphatase). The activity of all the curves was determined spectrophotometrically by calibration. Data were processed and statistically evaluated. The results showed that invasive plants changed the soil properties. The high sensitivity of microbial indicators confirms their suitability for monitoring and early detection of changes in the soil ecosystem.

Session 3 – Global change and invasions

AN OVERVIEW ANALYSIS OF *EICHHORNIA CRASSIPES*: EXPLORING ECOLOGICAL NICHE AND EFFECTIVE MANAGEMENT STRATEGIES

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Eichhornia crassipes, commonly known as water hyacinth, is a well-known weed native to South America and considered non-native in other regions of the planet. This macrophyte is extensively discussed in the literature due to its diverse uses and impact on freshwater ecosystems. Despite numerous studies being published, there is limited systematization of these findings, reflecting gaps in understanding the species' autecology to support effective management strategies. The main objective of this systematic review was to examine how knowledge about *E. crassipes* is structured in peer-reviewed literature whether there are sufficient traits documented to explain its invasive behavior outside its native range and to support management actions. To achieve this, a bibliometric analysis was conducted on 2121 publications from 1960 to 2023 sourced from the Web of Science database. Less than 10% of the publications reported functional traits in both native and invaded areas. There is a lack of data providing a clear understanding of the *Eichhornia crassipes* niche. Biological control is the most effective management measure for this invasive species. This review highlighted the need to address certain structural requirements, such as compliance with minimal biological and environmental data (EVB), to consistently address the biology and ecology of *E. crassipes* throughout its distribution range. The information gathered will facilitate the identification of alternative management measures for this species, such as, e.g., the utilization of its biomass as a raw material. This structured knowledge can furthermore increase understanding of the ecological, social, and economic impacts of this globally studied species.

Session 5 – Conservation issues and biological invasions

RESEARCH ABOUT NON-NATIVE FISHES IN INDIA: EXISTING EVIDENCE AND KNOWLEDGE GAPS

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India has experienced introductions of numerous non-native fishes (NNF) causing ecological and economic impacts. We carried out a systematic review to provide a comprehensive overview of existing evidence and knowledge gaps about NNF in India. Identifying 332 publications in total, we observed an exponential increase in published literature through time. Worryingly, about 40% of these publications appeared in potentially predatory journals. The relative majority (31%) of the studies focused on documenting fish diversity where NNF were opportunistic detections. We detected 58 NNF distributed across 17 basins in India and 18 fish species translocated within India. The Ganga has been the most intensively studied basin (113 studies) followed by the West Flowing Rivers from Tadri to Kanyakumari basin (37 studies). The common carp, *Cyprinus carpio*, is the most frequently reported NNF in India (160 studies from 12 basins), but Mozambique tilapia, *Oreochromis mossambicus*, is the most widely distributed NNF (reported from 13 basins). Our analyses also revealed how an extreme climatic event can abruptly increase the number of NNF in a river basin as well as India as a whole. Only 44% of the studies documented impacts of NNF and those that did mostly deduced information from the literature (58%). Qualitative impact documentations are far more common than quantitative assessments (69% and 31%, respectively) and most documented impacts have been ecological (79%), with only few studies reporting socio-economic (11%) or both types of impact (10%). Only 18% of the studies addressed the management of NNF. Our study enables targeted allocation of resources to understudied basins and advocates for more empirical impact assessments, enhanced collaborations, and a basin-level approach for managing NNF in India and beyond.

Session 6 – Pathways and dispersal of invasive species

PREDICTING THE DISPERSAL AND INVASION DYNAMICS OF AMBROSIA BEETLES THROUGH DEMOGRAPHIC RECONSTRUCTION AND PROCESS-EXPLICIT MODELING

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Evaluating potential routes of invasion of pathogens and vectors of sanitary importance is essential for planning and decision-making at multiple scales. An effective tool are process-explicit models that allow coupling environmental, demographic and dispersal information to evaluate population growth and range dynamics as a function of the abiotic conditions in a region. In this work we simulate multiple dispersal/invasion routes in Mexico that could be taken by ambrosia beetles and a specific symbiont, *Harringtonia lauricola*, responsible for a severe epiphytic of Lauraceae in North America. We used *Xyleborus bispinatus* Eichhoff 1868 as a study subject and estimated its demography in the laboratory in a temperature gradient (17, 20, 26, 29, 35°C), which we then used to parameterize a process-based model to estimate its metapopulation dynamics. The maximum intrinsic growth rate of *X. bispinatus* is 0.13 with a thermal optimum of 26.2°C. The models suggest important regions for the establishment and dispersal the states of Veracruz, Chiapas and Oaxaca (high host and secondary vectors diversity), the Isthmus of Tehuantepec (connectivity region), and Michoacán and Jalisco (important avocado plantations). The use of hybrid models is a promising tool to refine the predictions applied to the study of biological invasions and species distributions.

Session 6 – Pathways and dispersal of invasive species

FUNCTIONAL DIVERSITY IN ROADSIDE PLANT COMMUNITIES: A CASE STUDY ON THE IMPACT OF ALIEN SPECIES IN LITHUANIA

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Roadsides are man-made habitats that serve as a refuge for native plants, especially in agricultural landscapes. Alien species are closely linked to roadside habitats, as their spread relies heavily on transportation systems like roads, railways, airports, and ports. The current trend is to reduce the frequency of mowing on roadsides, which would have a positive effect on native flora and pollinators. Nevertheless, it could also accelerate the spread of alien plants along roadsides.
The study aimed to test whether the type of road impacts the presence of alien species in plant communities and to assess the impact of alien species on plant functional diversity.
The study was conducted in Lithuania and covered four types of roads – international, national, regional, and local. In total 100 sites were investigated, randomly and proportionally distributed across road types throughout the country. In each site, the roadside was divided into four main elements – road shoulder, first road slope, second slope or flat part and adjacent habitat. The functional diversity of the plant communities was evaluated using five plant traits (leaf mass, canopy height, leaf dry matter, releasing height, and specific leaf area). The vegetation plots and environmental data are stored in the vegetation database (EU-LT-002). A total of 371 native and 23 alien plant species were recorded in all of the one square meter vegetation plots, averaging 10.4 (± 4.1) species per plot. Preliminary results showed no significant differences in functional diversity between plant communities with and without recorded alien plant species, despite the differences in species richness across roadside elements. The study supports the hypothesis that the roadside environment is too harsh for plants with diverse traits to occur, and alien plants have minimal impact on changes in functional diversity in our studied small-scale roadside communities.
This work has been supported by the Lithuanian Research Council (LMT grant no. S-MIP-23-1).

Session 3 – Global change and invasions

THE "TERRIBLE TRIO" OF NORTH AMERICAN CRAYFISH IN NORTHWESTERN ITALIAN LAKES

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Invasive alien species (IAS) are worldwide recognized as one of the top drivers of species loss, negatively affecting local economy, ecosystem services and human well-being. The risk of IAS spreading, adaptation and environmental distress is most likely to increase with the upward trend of extreme weather events and globalization. Invasive crayfish are widespread in the Italian lakes, but still their distribution and interaction are poorly understood. We have conducted a study from May 2021 to September 2023 aimed to assess the coexistence of three invasive crayfish, *Faxonius limosus*, Pacifastacus leniusculus and *Procambarus clarkii* in three north-western Italian lakes: Maggiore, Mergozzo and Orta. We caught crayfish using traps across different littoral habitats (piers, beaches, reed beds) to better depict their spread. Morphological traits (body length and weight, cephalotorax length/width), Catches Per Unit Effort (CPUE), sex ratio and how they differ among the species and between the lakes were discussed. Faxonius limosus is so far diffused in the three lakes. The "terrible trio" actually coexists with *P. clarkii* and *P. leniusculus* only in Lake Maggiore. In lake Orta two species are recorded: *P. clarkii* and *F. limosus*, while *F. limosus* is still the unique in Lake Mergozzo. Further, *F. limosus* dominated in Lake Maggiore, but *P. clarkii* is the most abundant in Lake Orta. Both, *F. limosus* and *P. clarkii* demonstrated the maximum body length and weights in Lake Maggiore in respect to other lakes. At present, *P. leniusculus* was limited only in the northern part of Lake Maggiore (the Swiss part), overlapping with the other crayfish species. Despite the steady spreading in northwestern Italian lakes, the invasive crayfish suffered with the unprecedented heatwaves in 2023 and with most likely pathogen threats.

Session 2 – New tools and approaches for detection and monitoring

DNA METABARCODING TO TRACK HARMFUL MARINE MICROALGAE

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This research explores the utility of DNA metabarcoding in tracking harmful marine microalgae, offering insights into its efficacy and practicality for ecological monitoring. In ten marinas from the Azores, Madeira, and mainland Portugal, samples obtained from water, phytoplankton tows, and benthic scrapes were analyzed. Illumina MiSeq, targeting the 18S (V4 region) and CO1 genes, was used to identify diatoms and dinoflagellates. The results revealed the usefulness of metabarcoding in identifying harmful species, including toxin-producing microalgae. This study underscores metabarcoding's value as an accessible and comprehensive tool for ecosystem surveillance, emphasizing its pivotal role in early detection to enact timely measures for public health protection.

Session 6 – Pathways and dispersal of invasive species

MOLECULAR INSIGHT INTO THE POPULATION STRUCTURE OF THE NON-NATIVE BULLHEADS, *AMEIURUS* SPP. (ACTINOPTERYGII: ICTALURIDAE) IN THE CENTRAL EUROPEAN PART OF THEIR INVASIVE RANGE

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The invasive alien species include groups of non-native organisms whose presence in a certain area is caused by human activities, such as agri-and aquaculture, and natural transformation. This leads to the overcoming of basic biogeographical barriers, resulting in further spread. In the late 19th century, North American catfishes were imported into Europe for aquaculture and trade, leading to the establishment of self-sustaining populations of *Ameiurus nebulosus* (Lesueur, 1819) and *Ameiurus melas* (Rafinesque, 1820) through intentional or accidental human-mediated translocations.
Our research provides an extensive study of the populations of both brown and black bullheads in the invasive range, examining their expansion in Central Europe. Through the analysis of the partial mitochondrial cytochrome b gene, we investigated whether non-native populations of bullhead catfishes in Central Europe originate from one or several sources and assessed the diversity within specific bullhead populations. Sampling was conducted at 25 locations in Czech Republic, Poland, and Ukraine from 2018 to 2023, while two samples from the native range in the USA were used for phylogenetic analysis. European *A. nebulosus* exhibited twelve haplotypes, while *A. melas* showed three. Brown bullhead haplotypes formed two distinct geographic clusters: one comprising populations from the Elbe and Danube river basins in the Czech Republic, and the other including populations from the Oder basin (Poland, Czech Republic), and Ukraine (Vistula and Dniester basins). *A. melas* haplotypes formed a single genetic group, with one widespread haplotype encompassing introduced European populations. Two populations displayed unique haplotypes: Uzhhorod (Ukraine) and Pasohlávky (Czech Republic). The pathways of *Ameiurus* bullhead expansion in Europe are a growing concern, with their spread warranting increased attention and vigilance.

Session 1 – Risk assessment and management of invasive species

COORDINATED ACTION FOR INVASIVE SPECIES: STRATEGIES ACROSS FRANCE'S MEDITERRANEAN LANDSCAPES

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The Mediterranean region of France harbors a diverse and unique flora due to its mild climate, varied topography, and rich ecological history. In recent decades, the region has witnessed the emergence of factors such as urbanization, land use change, tourism, and global trade that have facilitated the introduction and spread of invasive species. Today, biological invasion emerges as a significant challenge to conservation efforts within this biodiversity hotspot.

Recognizing the urgent need to address this threat and establish a cohesive approach to invasive alien species (IAS) management across the southern regions of France, the Conservatoires Botaniques Nationaux were requested to develop regional strategies and action plans adapted to the environmental, social, economic and political realities. In 2014, a first regional strategy and an action plan were published for the Provence-Alpes-Côte d'Azur region. The objectives of this strategy were multifaceted, aiming to develop a scientific reference list of IAS and potential IAS, assess ongoing regional initiatives targeting IAS, gauge stakeholder expectations, and propose methodologies and an actionable plan. Moreover, beyond merely cataloging species at administrative regional levels, a nuanced analysis was conducted across different geographical scales, to take into account the specific environmental characteristics related to the distinct biogeographical regions. For each species identified as an IAS or potentially invasive, a rigorous risk analysis was conducted, encompassing biogeographical and ecological parameters to ascertain their local invasive potential.

In 2023, similar efforts have been undertaken for the Occitanie region, reflecting a steadfast commitment to harmonized invasive species management practices across France's Mediterranean territories.

A platform, INVMED-Flore, has been established to fulfill its mission of raising awareness, communicating with stakeholders, and supporting managers. It serves as a direct link between scientific research and practical field management approaches.

Session 1 – Risk assessment and management of invasive species

LINKING ECOSYSTEM CONDITION AND SERVICES WITH THE DISTRIBUTION OF INVASIVE HOGWEEDS – AN ESTONIAN CASE

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In Estonia, giant hogweed (*Heracleum mantegazzianum*) and Sosnowsky's hogweed (*Heracleum sosnowskyi*) have been under state-wide management for nearly 20 years by now, accompanied by significant costs for the state (eradication actions have mostly been financed by the government). Due to this, the current and historical distribution of hogweeds is well known and recorded in Estonia. Overlaying the results of the Estonian national mapping and assessment project of ecosystems and their services – ELME – with the locations of invasive hogweeds, it appears that their spread is clearly related to the poor state of the terrestrial ecosystems.

In ELME (https://loodusveeb.ee/en/countrywide-MAES-EE), the extent, condition, and ecosystem services (both biophysical and monetary values) have been assessed and mapped. Methodologies and state-wide spatially explicit layers have been provided. Regarding condition, terrestrial ecosystems have been mapped and classified according to their selected and aggregated characteristics to condition classes A–F that, in the case of forests, means the naturalness gradient, in the case of grasslands, implies to the success of the maintenance actions of semi-natural ecosystems, in the case of agricultural ecosystems, is mainly related to the presence and amount of landscape features, and in the case of inland wetlands (bogs, fens, mires), is mainly related to the drainage impacts. The condition classes are further aggregated into simple classes: good, moderate, poor (and 'not assessed').

By area, 54% of the hogweeds are spread in ecosystems in poor condition (overgrown grasslands, fields lacking landscape elements, heavily managed forests), where the provision of substantial and multiple ecosystem services is also disturbed. 22% of the areas are in moderate condition and 1% in good condition. Knowledge of the value and condition of the underlying ecosystem implies which control methods are acceptable to not further harm natural values, makes ecological restoration as well as development decisions easier, etc.

Session 1 – Risk assessment and management of invasive species

ECOLOGICAL NICHE MODELING AS A TOOL TO IDENTIFY POTENTIAL NEW INVASION AREAS FOR SEVERAL FRESHWATER DECAPODS IN SOUTH AMERICA

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Freshwater crustaceans possess a high potential for invasiveness and are often linked to the exploitation of natural resources and human activities, particularly in aquaculture within developing countries. In South America, the past decade has seen an increase in non-native and invasive freshwater species, primarily driven by climate change and the degradation of aquatic ecosystems. Ecological Niche Modeling (ENM) is extensively used to assess potential areas at risk of invasions, thus aiding in the prevention of invasive species expansion and guiding conservation efforts in freshwater ecosystems. This study aimed to model the ecological niche and evaluate suitable habitat areas for the occurrence of five potentially invasive species of freshwater decapods in South America: *Dilocarcinus pagei*, *Macrobrachium amazonicum*, *Macrobrachium jelskii*, *Macrobrachium rosenbergii*, and *Procambarus clarkii*. The variables used in the models were sourced from the Worldclim and EarthEv databases. ENM was performed using the Biomod2 and SDM package algorithms. Our results indicated that suitable areas for these freshwater decapods could cover up to 11% of South America. Model evaluations using True Skill Statistics (TSS) and Area Under the Curve (AUC) showed robust performance and accurate predictability. The suitable areas projected for South America included several hydrographic basins and Protected Areas. This study underscores the importance of conserving and preserving vulnerable habitats, particularly those within Protected Areas, to prevent the colonization by invasive species. The information generated can help identify areas susceptible to decapod invasion in South America and support local management and decision-making efforts.

Session 6 – Pathways and dispersal of invasive species

ADULT ENTEROPARASITIC FAUNA OF CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA* WALBAUM, 1792) IN LA BARRA TOLTÉN, LA ARAUCANÍA,CHILE: A POTENTIAL 'SPILLBACK' EFFECT?

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Invasive species can disrupt disease dynamics in new areas. During introduction, they may lose native parasites, representing an empty habitat available for the colonization of parasites from the native fauna of the newly colonized area. The spillback effect can negatively affect native fauna, as this new host would increase the infectious burden of native parasites in the environment. Over the last decades, chinook salmon has become invasive in central-southern Chile, ranging from 39°S to 53°S. Its anadromous migration and predatory behavior involve multiple interactions with various native species. We examined 124 digestive tracts of returning adult chinook salmon in La Barra, Toltén, La Araucania, Chile to characterize enteroparasites, classify parasite development, and assess chinook's potential as a definitive host for a local parasite. We identified 12,960 parasites belonging to the genera *Hysterothylacium* and *Anisakis* (Nematoda), *Lampritrema* and *Lecithaster* (Digenea), *Nybelinia* (Cestoda), and orders *Pseudophyllidea*, *Tetraphyllidea*, and *Trypanorhyncha* (Cestoda). Among them: one immature female and 23 males of *Hysterothylacium* sp., 6 *Lecithaster* sp. Adults, and one *Lampritrema* sp. Adult. Adults suggest chinook's competence for *Hysterothylacium*, *Lampritrema*, and *Lecithaster*, and as a new host for *Tetraphyllidea*, *Pseudophyllidea*, and *Nybelinia* sp. This study contributes to the understanding of the parasitic interactions of chinook salmon in Chilean coastal ecosystems and provides valuable baseline data for further research on the impact of these parasites on native species and ecosystem dynamics.

Session 5 – Conservation issues and biological invasions

THE 50-YEAR HISTORY OF ANGLERS' RECORD CATCHES OF GENUS CARASSIUS: CIRCUMSTANTIAL EVIDENCE OF WIPING OUT THE NATIVE SPECIES BY INVASIVE CONSPECIFIC

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Successful invasive non-native fish species can cause enormous damage to native biodiversity. In mainland Europe, the introduction of the gibel carp (*Carassius gibelio*) has led to a decline in populations of the formerly widespread native crucian carp (*C. carassius*). Both invasive and native species develop two phenotypes, namely stunted and deep-bodied, which depend on the intensity of competition and predation in the water body. The deep-bodied phenotype is associated with a more diverse fish community composition, can attain large sizes and is very attractive to recreational anglers. This study analysed trends in the record sizes of native crucian carp and invasive gibel carp (individuals close to the maximum attainable size of the species) reported by recreational anglers over the last 50 years in Czechia, recording the invasion of gibel carp from its beginnings to the fully established population phase. The study provides circumstantial evidence that gibel carp is behind transition from the relative abundance of large crucian carp to near extirpation, while large gibel carp have taken over the reports of record catches in the genus *Carassius*. This indicates that the crucian carp, which is currently classified as critically endangered in the Red List of Czechia, has very limited possibilities to realise its deep-bodied phenotype. It also shows the potential of using data from recreational anglers for mapping invasion processes and as a source of relatively localised information on endangered species.

Session 1 – Risk assessment and management of invasive species

THE COMPILATION OF THE NATIONAL LIST OF THE INVASIVE ALIEN SPECIES OF GREECE (HELLAS ALIENS): CHALLENGES AND OPPORTUNITIES

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The current contribution presents the comprehensive review of the Invasive Alien Species (IAS) of Greece which will form the National List of Alien Invasive Species of Greece in compliance with the EU Regulation 1143/2014. For this purpose, a database was developed with fields of information on the taxonomy, origin, ecology and pathways of introduction of terrestrial, freshwater and marine species. The database (HELLAS-ALIENS) includes a) taxa of the EU list already present in Greece, b) taxa present in Greece and considered to be invasive, and c) taxa highly likely to enter Greece in the next ten years and become invasive. Overall, the HELLAS-ALIENS comprises 126 species, i.e. 32 terrestrial and freshwater plant species, 14 terrestrial invertebrates, 28 terrestrial vertebrates, 30 freshwater fishes and invertebrates and 22 marine species. Terrestrial invertebrates, birds and mammals are mainly of Asiatic origin. Most of the terrestrial and freshwater plants have their native distribution in the Americas (North and South). Most of the freshwater invertebrates and fishes are of North American origin, while the majority of the marine species are of Indo-Pacific origin. The first records of IAS concern terrestrial plant species, and date back to the 19th century, while those in freshwater and marine environments seem to have been systematically recorded some decades later. Most of the taxa have arrived in Greece or are expected to arrive through escape from confinement and unaided. The majority of the terrestrial, freshwater and marine species have been evaluated as of High-risk for the indigenous biodiversity and only 3% of the species listed have been evaluated as of Low-risk. Our results provide an important baseline for management and action plans, as required by the priorities set by the European Union through the Biodiversity Strategy for 2030.

Session 1 – Risk assessment and management of invasive species

INVASIVE ALIEN SPECIES (IAS) IN THE CONTEXT OF THE WATER PLANNING AND MANAGEMENT IN THE TAGUS AND WEST RIVER BASIN DISTRICT

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In the Tagus and West River Basin District, invasive alien species (IAS) in aquatic and riparian ecosystems pose a significant challenge to the integrity of these ecosystems and the achievement of objectives outlined in the Water Framework Directive. The Tagus and West River Basin District represent the largest river basin district in Portugal, with the Tagus river basin being shared with Spain.
Within this district, various IAS, including plants, fish, crustaceans, and amphibians, are widespread across freshwater ecosystems, rivers, reservoirs, the Tagus Estuary, and the coastal lagoons of Óbidos and Albufeira.
This paper aims to present the outcomes of the inventory conducted in the River Basin Management Plan (RBMAP), with the objective of encompassing all efforts undertaken within this river basin district. Additionally, it will outline the measures, both at the national and regional levels, incorporated in the Program of Measures of the RBMP.
Furthermore, we will highlight some of the ongoing actions and projects in the Tagus and West River Basins, involving collaboration between the Portuguese Environment Agency and various stakeholders such as municipalities, water supply companies, and academic institutions.

Session 5 – Conservation issues and biological invasions

SUSTAINABLE FOREST MANAGEMENT AND COMBATING INVASIVE ALIEN SPECIES IN SINTRA

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In the 19th century, many exotic species were introduced to the Serra de Sintra from a wide variety of geographical areas. Their introduction was mainly for ornamental purposes, although some species were introduced for soil fixation and other forestry purposes (e.g. hedge construction). Some of these species have typical characteristics of invasive species which, combined with the successive abandonment of various properties in the Serra de Sintra and the forest fires that occurred, in particular the great fire of 1966, were the great driving force behind the rapid development of invasive species that has characterised the Serra de Sintra to this day. Among the invasive species currently found in the Serra de Sintra, the following stand out: Mimosa (*Acacia dealbata*), Australian blackwood (*Acacia melanoxylon*), Sydney golden wattle. (*Acacia longifolia*), Hakea-willow-leaved hakea (*Hakea salicifolia*), sweet pittosporum (*Pittosporum undulatum*), pampas grass (*Cortaderia selloana*). Aware of the importance of this problem and the state of degradation caused to the Natural Heritage of Serra de Sintra, Parques de Sintra's policy has been based on acting upstream of the problem, investing in a strategy that, in the long term, results in the recovery of areas that are totally compromised and threatened from an ecological point of view. Parques de Sintra is currently responsible for managing 972 hectares of forest. The company's concern has always been to invest in sustainable forest management based on nature conservation. The first interventions in the area to actively combat invasive species date back to 2001. Using a variety of combat methods (manual, chemical and mechanised), adapted to the location, degree of invasion and ecological sensitivity, followed by afforestation with species native to the Serra de Sintra, there are areas where the recovery of the shrub cover is already at a high stage of consolidation.

Session 2 – New tools and approaches for detection and monitoring

USING DIGITAL DATA TO EXPLORE THE TRAITS OF INVASIVE PLANT SPECIES AND THE HABITATS THEY OCCUPY

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Online digital data (e.g., aggregated data from online searches) holds a major potential as a supplementary source of information on ecological patterns and processes and can aid environmental management efforts. Species traits (e.g., related to phenology and reproduction) and habitats that species invade are essential for assessing invasion success. This data is often not available or inaccessible, and acquiring such information is expensive and time-consuming. To explore the potential of digital images that were created for other purposes in capturing information on the alien plant species traits, habitats they occupy, and their global invasion patterns, we gathered images of *Carpobrotus* spp. populations — a highly invasive plant of coastal areas — from Instagram, Flickr and iNaturalist. We used image recognition to automate species identification, reproductive structure detection, and habitat classification. Images from iNaturalist, a citizen science platform, were used for training and validation of automatic image recognition of Carpobrotus spp. And its reproductive structures (i.e., flowers, flower buds, and fruits) using YOLOv8 model (an object detection deep learning model). The validated model was then used to analyse Instagram and Flickr images. Automatic habitat classification was done with Recognize Anything Model (RAM, a multi-label image recognition model). With RAM, we recorded the presence of other plant species and determined whether the population occurred in natural or (semi)urban habitats. We then assessed the phenology of populations as recorded across platforms, and evaluated spatiotemporal trends in phenology, reproduction, and habitats and across native and non-native regions if data was geolocated. Our results suggest that complementing information from citizen science and social media platforms provides a cost-effective approach for understanding plant invasions while accounting for different biogeographic and environmental contexts.

Session 1 – Risk assessment and management of invasive species

AN EXAMPLE OF THE GIS-VIEWER: *DIDYMOSPHENIA GEMINATA* (SCHMIDT) ROCK SNOT. PRESENCE IN SPAIN

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Didymosphenia geminata is a microscopic freshwater diatom capable of forming massive blooms. The cells produce an extracellular mucopolysaccaride stalk that can attach to substrates. Nuisance blooms resembling wet wool have been recorded in North America and Europe over the past several years, where they have a significant impact.

The species profile is presented as part of the work of creating an Aquatic Invasive Alien Species (IAS) GIS-Viewer being carried out by the Centre for Hydrographic Studies (CEH-, CEDEX) for the General Directorate for Water of the Ministry for Ecological Transition and the Demographic Challenges (MITECO). https://ceh.cedex.es/visoreei/visor/principal/index.html

The species profile includes taxonomic information, description, life cycle, habitat, requirements, introduction pathways, natural and current distribution, impacts, management, bibliography and regulations. This information, along with what can be consulted in the GIS-Viewer, allows us to locate sightings and citations in affected water bodies, the age of the sighting, the danger, and the impact, having, therefore, a complete tool that help us in the management, prevention, control, mitigation and understanding of aquatic invasive species.

Session 1 – Risk assessment and management of invasive species

APPLICATION OF A SIMPLIFIED RISK ASSESSMENT METHOD FOR CONTROLLING INVASIVE ALIEN PLANT SPECIES IN PROTECTED AREAS: A CASE STUDY OF CZECH REPUBLIC

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The introduction of non-native plant species is a major challenge to the conservation of biodiversity and the maintenance of ecosystem services in protected areas worldwide. Given the growing importance of these areas as refuges for native species, development of cost-effective systems for prioritization of the risk of invasive plant species, as well as for their better management, are crucial. The current study focuses on developing and testing a simplified manual risk assessment method to identify areas of high, medium and low management priority within National Parks of the Czech Republic. This manual assessment involves individually testing each locality with occurrences of invasive species, like *Lupinus polyphyllus*, *Robinia pseudoacacia* and *Impatiens glandulifera*, to determine its proximity to buffer zones or its placement within or outside the protected areas, as well as its proximity to vectors of spreading (roads and/or streams). Simultaneously, the habitat data were incorporated to the analysis to examine the connection between the invasive plant specie's occurrence and their habitat preferences. A comparison between the results given by the GIS-based method and the ones from the manual approach, using binomial distribution model, showed no significant differences in risk classification. However, a notable rate of disagreement was observed in the classification of the 3rd priority category, mainly due to the lack of a habitat layer in the GIS classification. Building upon the success of this approach in a limited area in Šumava National Park, the methodology was extended to generate risk maps for other species and other NP in the Czech Republic. The use of a simple procedure using GIS tools enables protected area managers to effectively control invasive species, with the only limitation being the necessity of relatively precise knowledge of the presence of the species within the protected area.

Session 2 – New tools and approaches for detection and monitoring

BIODIVERSITY IN THE CITY - ENGAGING THE PUBLIC IN REYKJAVÍK, ICELAND

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Green spaces are important to urban biodiversity, however, this is threatened by the loss of green spaces, climate change, and problematic alien plants. In subarctic cities like Reykjavík, climate change is increasing the risk of establishment and spread of alien and invasive plants at the expense of losing native plant diversity. Furthermore, as Reykjavík pursues densification as a climate change strategy, the need to conserve and manage green spaces for biodiversity increases. We organized an interactive lecture series and guided plant harvesting and bird watching walks, inviting people of all ages to journey through local green areas. We aimed to bring awareness about invasive plants while inspiring curiosity and action. The events highlighted two edible problematic alien plants, Cow Parsley (*Anthriscus sylvestris*) and Sweet Cicely (*Myrrhis odorata*), which are common in Reykjavík. We provided information on managing and harvesting these plants, as well as having a network of small and large green spaces throughout the city for overall biodiversity. We developed a social media platform "Borgarnáttúra – Urban Biodiversity Iceland" to further engage and inspire the public. Our collaborators included the Reykjavík Botanic Garden, Landvernd – Icelandic Environment Association, Nordic House, and Sónó Restaurant. This project continues to foster neighborhood awareness and offers residents a chance to connect with their local nature and manage invasive plants. We are seeking collaborations with other countries to further develop public outreach and management of urban biodiversity.

Session 2 – New tools and approaches for detection and monitoring

DEVELOPING SYNERGIES BETWEEN MONITORING, RESEARCH AND MANAGEMENT TOOLS FOR ALIEN SPECIES: A CASE STUDY FROM NORWAY

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Alien species (AS) are considered a threat to native biodiversity and ecosystems, and can cause economic harm. Increased global inter-connectivity has led to the highest recorded rates of alien species introductions in Europe. The costs associated with controlling alien species are enormous, and a key target of the new global framework for managing nature through 2030 is to prevent or reduce the rate of introduction and establishment of invasive alien species by 50%, and control or eradicate such species to eliminate or reduce their impacts. To achieve this goal, integrated systems are needed that link monitoring and management tools, allowing for information flow and synergistic interactions between them. We present the framework for a large-scale, comprehensive AS management systems currently under development in Norway. The framework consists of three modules: assessment, monitoring, and response. The assessment module is coordinated by the publicly funded Norwegian Biodiversity Information Center which provides national risk assessments of AS in Norway every 5 years and conducts horizon scanning to identify potential doorknocker species. The monitoring module includes multiple, long-term monitoring programs funded by the Norwegian Environment Agency that effectively cover the entire biological invasion process from introduction through establishment and spread. Harmonized methodology, taxonomy, data structures and metadata ontologies between monitoring programs contribute to improved information flow. The response module is funded by the Norwegian Environment Agency and involves eradication and control measures carried out at local or regional levels by municipal authorities. Information flow between the modules is identified as key for maximizing synergies between these management tools. This information flow can, for example, allow data driven horizon scanning for AS. However, we observe that the framework in its current form lacks formalized structures for information flow, which may be restricting the potential of this alien species management framework.

Session 1 – Risk assessment and management of invasive species

PROGRESS OF MANAGEMENT ACTIONS IN THE LIFE RIPARIAS PROJECT: RIVER-BASIN-WIDE STRATEGY PAYS OFF

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Management of biological invasions represents a pressing challenge demanding strategic and coordinated resource allocation. The LIFE RIPARIAS seeks to address Invasive Alien Species (IAS) planning deficiencies by developing a scientific evidence-based workflow to guide decisions about IAS management. The project implements effective interventions, ranging from early detection and rapid eradication of emerging species to customised management approaches according to species distribution. Priority species and sites for management were identified and interventions operationalised through river-basin-wide strategies discussed with stakeholders and approved by political authorities. The project underscores rapid response measures targeting emerging species including *Lysichiton americanus*, *Ludwigia peploides*, *Crassula helmsii*, and *Zizania latifolia*. Between 2021 and 2023, all *L. Americanus* plants were manually removed from three populations, with one considered eradicated. Manual extraction was conducted in two *L. peploides* populations, resulting in oneeradication. Despite efforts, *C. helmsii* and *Z. latifolia* populations have persisted. Additionally, management actions were undertaken for two populations of *Procambarus clarkii*, with one expected to be eradicated. For widespread species, the project has distinct strategies for managing two riparian and threeaquatic plant species, i.e. the core area and the pest-free area strategy. The considered species are *Impatiens glandulifera*, *Heracleum mantegazzianum*, *Hydrocotyle ranunculoides*, *Ludwigia grandiflora* and *Myriophyllum aquaticum*. Currently, 19 sites are managed under the pest-free area strategy, and 23 under the core area strategy. LIFE RIPARIAS will implement management actions until 2026. With a six-year runtime and co-funding from the LIFE program of the European Union and three Belgian regional authorities, it embodies a collaborative effort for enhanced IAS management. The coordinated actions, operationalized through river-basin-wide strategies, offer a model for efficient and cohesive management structures, minimizing biological invasions.

Session 2 – New tools and approaches for detection and monitoring

USING CITIZEN SCIENCE TO MONITOR THE NON-NATIVE SEA SLUG SPOTTED SEA HARE APLYSIA DACTYLOMELA RANG, 1828 IN THE ADRIATIC SEA IN CROATIA

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The spotted sea hare *Aplysia dactylomela* Rang, 1828 (Mollusca: Gastropoda: Aplysiidae) is a conspicuous sea slug originating from the Atlantic Ocean that was first recorded in the Mediterranean Sea in 2002. It has since spread rapidly along the central and eastern Mediterranean coastline, including the Adriatic Sea. The first reported sightings in Croatian waters were from the islands of Sušac and Mljet in southern Croatia in the summer of 2006. A mass occurrence and spawning of the species was observed off the remote Island of Brusnik in the Central Adriatic in 2012, prompting the need for monitoring. Following an intensive public awareness campaign in 2013, we began collecting observation data from a range of sea users in Croatia. Due to its large body and characteristic pattern of irregular black rings, the spotted sea hare is easily recognizable in the field and is therefore suitable for monitoring using a citizen science approach. In the past 10 years, we have received 40 reports on the distribution and ecology of the species, accompanied by photographs or videos providing evidence confirming identification. The data shows that the species is spreading along the eastern side of the southern and central parts of the Adriatic Sea, in both coastal and island regions, where it has established a permanent but sparse population. Most reports record single specimens and a mass occurrence similar to the 2012 event has not been reported since. Specimens were mainly observed inhabiting rocky seafloors up to 4 m in depth. Our study shows that a citizen science approach can be successfully used for national-scale monitoring of non-native marine benthic species.

Session 5 – Conservation issues and biological invasions

INVASIVE ALGAE JOIN THE DARK SIDE; EFFECTS OF *RUGULOPTERYX OKAMURAE* IN TWO SUBMERGED MARINE CAVES OF SPAIN

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Marine caves represent one of the most confined and ecologically significant habitats in marine ecosystems. These unique environments host a diverse array of species, some of them adapted to very stable conditions due to absence of light and low water flow. However, the great environmental adaptability of invasive species may threat such ecological balance. The invasive macroalgae *Rugulopteryx okamurae* is widely spreading throughout the Mediterranean and Atlantic coasts, becoming a major driver of benthic homogenization. This species outcompetes resident biota due to its aggressive colonization and proliferation across a great variety of substrata type. Since 2020, *R. okamurae* has been detected in submerged cave habitats of the northern Alboran Sea. Despite the inability of the species to successful colonize these sciaphilic habitats, the increasing biomass outside the cave may lead unattached mats to flow into inner areas of the caves, which can entangle erect and arborescent life forms growing on the walls but also create deposits on sedimentary bottoms. In this context, macroalgae deposition and accumulation contributes to increased organic matter and hypoxic conditions, modifying the community structure and ecological processes. Nonetheless, mats inflow is expected to vary through the year depending on macroalgae biomass production and the hydrological confinement level of the cave. This study explores for the first-time potential effects from accumulation of *R. okamurae* mats inside 2 marine caves (Granada, Spain) along different seasons. Several cases of entangling on erect sessile species at sciaphilic areas are reported. Additionally, sediment samples and coverage of deposited algae were analysed to link the presence of macroalgae mats to changes in the soft bottoms ecological processes. To do so, multiple physicochemical variables (organic matter, granulometry, heavy metals content) and biotic data (abundance of main taxonomic groups like annelids, molluscs and crustaceans) were assessed.

Session 1 – Risk assessment and management of invasive species

TEMPERATURE AS AN EFFECTIVE BIOSECURITY TOOL AGAINST INVASIVE SNAKES

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The application of thermal treatments could serve as a biosecurity tool to avert snake introduction, which often leads to irreversible ecological impacts. Here, we tested the applicability of radiative heating and thermal fumigation to prevent the spread of California kingsnake (*Lampropeltis californiae*), a damaging species established in the island of Gran Canaria and likely to reach other vulnerable regions, for which it is included among the most concerning invasive species of the European Union. We exposed 24 individuals to a thermal gradient to determine species selected temperatures, range of preferred temperatures and voluntary thermal maximum and used other 24 individuals to analyse their response to radiative heating, thermal fumigation and control (no heat) treatments. *Lampropeltis californiae* selected temperatures of 27.80 ± 1.05°C (ranging 26.86 °C ± 1.21 °C to 28.68 °C ± 1.25 °C) and a voluntary thermal maximum of 32.50 ± 3.69 °C. Radiative heating and thermal fumigation performed equally well, inducing the exit of 83.33% and 91.67% of all individuals after 14.36 ± 9.25 min and 11.13 ± 8.60 min of exposition, and at a body temperature of 35.66 ± 3.53 °C and 35.57 ± 2.41, respectively. Control treatments produced the exit of 29.17% of all individuals, which came out of the box in 24.80 ± 8.83 min and at 28.45 ± 1.17°C. Thermal treatments could serve as an effective tool to prevent the inadvertent transportation of *L. californiae* and other invasive snakes threatening numerous regions around the globe.

Session 2 – New tools and approaches for detection and monitoring

NON-INDIGENOUS MARINE BENTHIC SPECIES IN THE PORT OF SINES AND ADJACENT AREAS (SW PORTUGAL)

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The introduction of non-indigenous species (NIS) is one of the most significant causes of biodiversity loss in marine ecosystems. In recent years, the number of marine NIS has increased significantly, often associated with the increase in maritime traffic, identified as the main pathway of their introduction.

This study provides a comprehensive list of the NIS detected in the Port of Sines, the national port handling higher cargo volumes, and neighboring areas. Benthic communities were assessed between 2009 and 2023 in different environments (intertidal hard substrates, natural and artificial, and subtidal hard and mobile substrates), as part of the monitoring program of marine environments of the Port of Sines. Different methodologies were applied, such as visual censuses (quantification of percentage cover using 50x50 cm quadrats, density quantification in band transects, and qualitative temporal surveys), sediment dredging, and colonization experiments on artificial hard substrates.

A total of 42 NIS was cataloged. Most species are macroalgae (Chlorophyta, Rhodophyta, and Ochrophyta; 12 species) and arthropods (11 species), native from the Pacific (25 species) and Atlantic regions (7 species). Clandestine transport vectors are the most likely for their introduction.

It is important to continue monitoring the occurrence and dispersion of NIS in the Port of Sines to evaluate, among other issues, the effectiveness of the implementation of management measures such as the Ballast Water Convention.

Session 6 - Pathways and dispersal of invasive species

INVASION PATTERNS OF EXOTIC EARTHWORMS IN GALAPAGOS: RELATIONSHIPS WITH ENVIRONMENTAL FACTORS, LAND USE AND TORTOISE CORRIDORS

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The spread of invasive species poses a significant ecological threat, particularly in insular environments where such disturbances can precipitate biodiversity loss. The Galapagos Archipelago, a seminal site for evolutionary studies, exhibits a unique biota currently at risk from multiple introduced species used for agriculture, livestock, and ornamental purposes. This research focuses on the invasive dynamics of exotic earthworms (Oligochaeta), recognized as ecosystem engineers, and their facilitative role in the establishment of non-native plants like *Rubus niveus*. These plants spread from agricultural zones, thereby encroaching upon and potentially displacing the native *Scalesia pedunculata* forests. We have examined the colonization patterns of earthworms across Santa Cruz Island, their interactions with environmental variables, and anthropogenic disturbances, with particular emphasis on the ecological corridors used by the native giant tortoises (*Chelonoidis nigra*). These corridors are hypothesized to assist in the passive dispersal of earthworms by these migratory tortoises, potentially enhancing earthworm distribution across both disturbed and undisturbed habitats. Methodologically, earthworms were extracted from soil monoliths across a gradient of human impact, from the pristine forests within Galapagos National Park to heavily altered agricultural and urban settings. Additional collections were made along tortoise migration paths to evaluate their role in earthworm dispersal. Environmental parameters—including plant species diversity, land usage, conservation status, elevation, soil pH, organic content, nitrogen levels, and texture—were meticulously recorded. Molecular analyses involved DNA extraction followed by sequencing of the COI gene to determine species identification and phylogenetic relationships. Findings from this study elucidate the habitat preferences of these earthworms, clarify their ecological interactions, and assess their invasion potential, which will be instrumental in developing targeted management strategies to curb their spread.

Session 5 – Conservation issues and biological invasions

DIGGING UP TROUBLE: IMPACTS OF *CARPOBROTUS* SPECIES ON SOIL CHARACTERISTICS AND SOIL MICROBIAL COMMUNITIES

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Invasive alien species pose significant threats to coastal ecosystems worldwide. *Carpobrotus* sp. pl. is one of the most threatening invasive species to biodiversity in coastal regions globally. *Carpobrotus* species are known to modify soil conditions and impact the diversity and composition of soil microbial communities in the invaded areas.

In this research, we explored the influence of *Carpobrotus* sp. pl. on soil characteristics, bacterial, fungal diversity and community composition across 17 populations located in Europe and the USA (introduced range) and South Africa (native range).

At each population, we collected soil from areas with and without the presence of *Carpobrotus* sp. pl., with three replicates per site to account for spatial variability. Soil physico-chemical properties, including pH and nutrient content, were analyzed to assess alterations induced by *Carpobrotus* invasion. Bacterial and fungal communities were also characterized through DNA meta-barcoding to elucidate their responses to the presence of *Carpobrotus* sp. pl.

Preliminary results revealed substantial variations in soil properties and microbial composition between areas with and without the presence of *Carpobrotus* sp. pl. within and across sampled areas. Furthermore, distinct shifts in bacterial and fungal communities were detected, indicating potential modifications of soil microbiomes that are associated with *Carpobrotus* invasion.

This multidimensional approach provides valuable insights into the ecological impacts of *Carpobrotus* sp. pl. Across diverse geographic regions and the risk of modifications in ecosystem functioning.

Session 3 – Global change and invasions

SURVIVING THE TRIPLE THREAT: ASSESSING THE RESILIENCE OF *CARPOBROTUS* SPP. TO COMBINED EFFECTS OF TEMPERATURE, DROUGHT, AND SALINITY IN A CHANGING WORLD

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Invasive alien plants (IAPs) and climate change represent two major threats that simultaneously disturb the balance of ecosystems and biodiversity. Understanding the ability of IAPs to adapt and recover physiologically to different abiotic stresses under climate change can be crucial in predicting their possible future invasion. For this reason, in this study, we tested experimentally the single and combined effect of three different abiotic stresses (temperature, salinity and drought) on six populations of *Carpobrotus* spp. belonging to two distinct genetic clusters from four countries (South Africa, Spain, USA and New Zealand). The primary objective was to understand if and how these conditions impact the physiology and initial growth of the plants. Another objective was to investigate the resilience of plants during a post-stress period.
Six hundred ramets were planted in individual pots in a growth chamber for three weeks of acclimatization at 25/15°C (day/night). At the end of this period, biometric, physiological and biochemical measurements were taken. Afterwards, conditions were changed, and the plants were subjected to five weeks of stress (temperature 35/25°C, 800 mM NaCl and no water). During this period, measurements were repeated after two and five weeks. Lastly, conditions were set to the initial ones for three weeks of recovery. The same parameters were monitored at the end.
Results show clear differences between populations and clusters, depending on the applied stress. The single effect of temperature does not seem to affect the plants severely. On the contrary, the combined stress of temperature and salinity seems to be the worst, not allowing plants to recover efficiently. Moreover, cluster B appears to be more resistant than cluster A.
These findings shed light on the complex interaction between genetic variation and environmental stress factors in *Carpobrotus* spp. Furthermore, the research underlines the importance of considering multiple stress factors simultaneously.

Session 6 – Pathways and dispersal of invasive species

ASSESSMENT OF RISK AND RISK-REDUCING MEASURES RELATED TO DISPERSAL OF THE INVASIVE ALIEN CARPET TUNICATE *DIDEMNUM VEXILLUM* IN NORWAY

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Didemnum vexillum is a colonial sea squirt, a marine species that originates from the northwest Pacific, which was first recorded in Norway in December 2020. The species has great invasive potential and potentially major negative impact on biodiversity. It also poses a risk to marine industries, such as shipping and aquaculture, with possible major negative economic impacts. VKM considers it likely that *D. vexillum* arrived at the Norwegian coast as epifouling on a vessel. Whether there was a single introduction followed by additional spreading or several separate introductions is not known, but the affected locations are either busy ports, shipyards or lay-up areas for petroleum installations. The species is currently found at six disjunct locations, and further spread is monitored through eDNA analysis of water samples and visual inspections. VKM assesses that *D. vexillum* represent a high risk to several ecosystems: hard bottom communities, shallow cold-water coral reefs, kelp forests, maerl beds, eelgrass meadows, and gravel and sand bottoms containing European oysters or horse mussels. For kelp forests, VKM assesses *D. vexillum* as posing a moderate risk. The main effects on kelp forest are through reduced nutrient availability, growth, and reproduction. Moreover, there are effects on the associated communities within the kelp forest through overgrowth and competition for space with other species associated with kelp. VKM has also assessed the risk *D. vexillum* pose to various types of aquaculture in Norway. Finally, VKM evaluated possible measures to eliminate and prevent further spreading of *D. vexillu*m from current populations, both at different spatial levels and at different time frames. Measures include various new technologies, governmental regulations, and international collaboration. Importantly, measures carried out to prevent new introductions of *D. vexillum* to Norway, and spreading within Norwegian waters, will also likely prevent other invasive biofouling species from entering Norway.

Session 3 – Global change and invasions

GLOBAL WARMING AFFECTS FORAGING EFFICIENCY OF INVASIVE FISH BY INFLUENCING MUTUAL INTERFERENCE

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Invasive species affect global biodiversity and are often eurytopic, and tend to originate from warmer areas than at invaded ecosystems. Therefore, global warming may further favour thermophilic invasive species over natives. One of the mechanisms of the impact of invaders on local communities is predation. Earlier studies on the effects of invasive predators on prey populations in the light of global warming were often based on single predator individuals which was a simplification of natural conditions. However, the outcome of a predator-prey interaction may be predator-density dependent, because of the non-trophic interactions between foraging predators. These, in turn, could be further mediated by temperature, e.g. by changing the energy demands of predators. Our study aimed to expand the knowledge about the combined effects of elevated temperature and predator density on the foraging efficiency of an invasive predator. We performed a laboratory experiment using a functional response approach with three densities (1, 2, and 4 specimens) of an invasive fish predator (the pumpkinseed, *Lepomis gibbosus)*, two temperatures (25 and 28°C), and six densities of amphipod prey (*Dikerogammarus villosus*). We observed a decrease in the foraging efficiency of a single predator at the elevated vs ambient temperature. However, this effect of temperature was further mediated by the presence of conspecifics. Specifically, we observed consistent antagonistic interactions between the grouped predators, but the magnitude of these interactions was reduced at the elevated vs ambient temperature. As a result of these two temperature-mediated effects, predation efficiency did not differ between the elevated and ambient temperature when predators foraged in groups. Thus, we strongly encourage to include the predator density as an additional factor when studying the effects of invasive predators on prey communities in the future. This research was supported by the National Science Centre, Poland (Grant No. 2020/39/D/NZ8/01226).

Session 5 – Conservation issues and biological invasions

ASSESSING THE ROLE OF NON-NATIVE SPECIES AND ARTIFICIAL WATER BODIES ON THE TROPHIC AND FUNCTIONAL NICHE OF MEDITERRANEAN FRESHWATER FISH COMMUNITIES

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Habitat alterations and the introduction of non-native species have multiple ecological impacts, including biodiversity loss and a deterioration of ecosystem functioning. The effects of these combined stressors on the community trophic web and functional niche are, however, not completely clear. Here, we investigated how artificial ecosystems (i.e. reservoirs) and non-native species influence the trophic and functional niche space of freshwater fish communities. To do so, we used carbon and nitrogen stable isotope and abundance data to compute a set of isotopic, trait and functional metrics over 13 fish communities sampled in 12 ecosystems from Türkiye as model sites. We show that in reservoirs, fish were more similar in their trophic niche compared to lakes, where the trophic niche was more variable, as a result of the higher habitat complexity. However, there were no differences in the trait and functional metrics between the two ecosystem types, suggesting a higher prey diversity than assumed in reservoirs. We also found that the number of non-native species did not affect the trophic niche space, nor the trait or functional space occupied by the fish community. This indicates that non-native species tended to overlap their trophic niche with native species, while occupying empty functional niches in the recipient community functional space. Similarly, the proportion of non-native species did not affect any trophic, trait, or functional metric, suggesting that changes in community composition were not reflected in changes in the community niche space. Moreover, we found that trait richness, but not functional richness, was positively related to the isotopic niche width and diversity, indicating that a wider occupied trait niche space corresponded to a wider occupied trophic niche and a lesser interspecific similarity. Our findings underscore the complexity of ecological relationships within freshwater ecosystems and highlight the need for comprehensive management strategies to mitigate the impacts of human activities and biological invasions.

Session 1 – Risk assessment and management of invasive species

CAN EUROPEAN HABITAT SUITABILITY MODELS INFORM INVASION RISK IN NORTH AMERICAN FRESHWATER ECOSYSTEMS? A CHINESE POND MUSSEL (*SINANODONTA WOODIANA*) CASE STUDY

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Freshwater mussel invasions are often highly disruptive to ecosystems and are costly to manage. Habitat suitability models can help predict which species pose the most invasion risk and reveal geographic areas in which establishment is most likely. We reviewed published habitat suitability models for freshwater mussels and catalogued variables that were identified as important in predicting habitat suitability. We then evaluated the availability of compatible environmental data sources spanning both Europe and North America with an eye towards projecting invasion risk across continents. We identified 25 unique environmental variables recognized as important predictors of mussel presence across 7 studies. Most variables were measures that readily translate across continents, including elevation, climate, land cover (especially urban and agricultural), dam presence, and stream size. As a case study, we use MaxEnt to model habitat suitability for Chinese Pond Mussel (*Sinanodonta woodiana*) within its invasive range in Europe. We use this model to predict areas of suitability within the Delaware River watershed in eastern North America, where the species was recently rediscovered. The results will inform rapid response efforts for this species, including targeted sampling and eradication campaigns. Together, our results suggest that cross-continental projection of freshwater mussel habitat suitability (and therefore establishment risk) could be much more commonly used, resulting in increased preparedness for responding to new freshwater mussel invasions.

Session 5 – Conservation issues and biological invasions

SHIFT IN PARASITE LOAD IN NATIVE AND NON-NATIVE EUPERCARIAN FISH SPECIES LIVING IN SYMPATRY

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Non-native introduced species can affect the parasite diversity and distribution in ecologically or phylogenetically related native species when they live in sympatry. Non-native species may co-introduce non-native parasites that can infect native hosts, or they may act as competent hosts for native parasites, multiply and spill them back to native hosts. Moreover, when non-native species are resistant to native parasites, decreased infection in native hosts may occur as a result of dilution effect. In this study, we compared parasite communities in allopatric and sympatric populations of the native European perch *Perca fluviatilis* (Percidae, Eupercaria) and the non-native pumpkinseed sunfish *Lepomis gibbosus* (Centrarchidae, Eupercaria), introduced to Europe from North America. The overall parasite species richness was significantly higher (almost two-fold) in native fish, but parasite abundance varied widely among localities. While introduction of pumpkinseed did not affect parasite diversity and species composition in perch, perch shifted parasite communities of pumpkinseed. Parasite diversity was higher in sympatric pumpkinseed populations, along with lower dominance. Nevertheless, infracommunity richness, i.e. the number of parasite species infecting a single host, as well as parasite abundance, increased in perch living in sympatry with pumpkinseed. The same trend was observed for parasites acquired in pumpkinseed in Europe; higher species richness and abundance were found in populations with co-occurrence with European perch. Our study showed that the introduction of a non-native host can alter the dynamics of native parasites, especially those species for which the introduced host is competent.
Acknowledgement: this study was supported by CSF project No. 23-07185S.

Session 5 – Conservation issues and biological invasions

A MULTI-TAXA APPROACH TO ASSESS THE IMPACTS OF *CARPOBROTUS* SPP. ON NATURAL COMMUNITIES IN A SMALL MEDITERRANEAN ISLAND

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The ecological impacts of *Carpobrotus* species on natural vegetation and soil have been widely documented, identifying them as responsible for relevant changes in Mediterranean habitats. However, their impacts on the other communities are poorly understood. Therefore, it is fundamental to consider different taxa to thoroughly evaluate the impacts of *Carpobrotus*. This approach is particularly interesting in small Mediterranean insular contexts, since different natural habitats of conservational interest are threatened, and the effects of the invasion process are particularly unpredictable in a limited geographical area. We assessed the impacts of *Carpobrotus* spp. following a multi-taxa approach on priority habitats of Giglio Island, a small Mediterranean island in Central Italy, aiming to depict the ecological processes in action. In 2023 we surveyed garrigues of rocky cliffs in 18 randomly selected 4 m^2 plots: 6 in contexts still invaded, 6 in patches where the species had been previously eradicated (in early 2022), and 6 in natural uninvaded habitat. In each plot we sampled: vascular plants, bryophytes, ants, soil microarthropods, molluscs, soil microbiota, and measured soil parameters. Preliminary results have shown a differential response of the taxonomic groups to the impacts of *Carpobrotus*. First, the negative impacts on vegetation and soil were confirmed. Second, communities of arthropods and microbiota showed an important change in composition in invaded habitats, due to strong changes in vegetation and soil. Third, we found that bryophyte and mollusc communities were more represented in invaded contexts, probably in relation to the new microhabitats formed by the monospecific mat of *Carpobrotus*. Finally, after one year from the eradication, we recorded an initial colonization of ruderal plant species and changes in the soil characteristics (e.g., soil moisture, litter). Hence, we found that *Carpobrotus* significantly alters the biodiversity of natural Mediterranean communities and causes complex patterns of variation when considering multiple groups of organisms.

Session 6 – Pathways and dispersal of invasive species

ON THE WAY TO NORTH: IDENTIFIED INVASION PATHWAYS OF IAS OF UNION CONCERN TO FINLAND

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Globally, invasive alien species (IAS) represent one of the major threats to biodiversity. According to the EU Regulation 1143/2014, each member state is required to conduct an analysis of invasion pathways and establish an action plan on the priority pathways of introduction and spread of IAS of Union concern. In Finland, such action plans have been conducted separately for the first list of IAS of Union concern and for each amendment of the list. Here, we report the priority pathways according to CBD pathway classification for all IAS of Union concern. The CBD classification divides pathways of introduction and spread into six categories, which are further divided into 44 pathway subcategories. Thirty-seven of the 88 IAS of Union concern (42%) have been detected in Finland. Ten of them have been established into Finnish nature, 21 species are kept in confinement and six species have been detected as casual species in nature. For the 37 species, the most commonly detected pathway was escape from confinement (30 species). Usually, species were introduced to botanical gardens/zoos/aquaria, as pets/aquarium species or as ornamental plants. Other pathways have been seldom detected in Finland: intentional release into nature for fishery, hunting or other purposes (5 species), unintentionally as contaminants in habitat material (3 species) or using stowaways (4 species). Eight species were known to spread unaided. The results suggest that a key management measure for the spread of IAS of Union concern in Finland is the prevention of escape under human control. Targeted communication related to the release of alien fish and game animals is also needed. Prevention of unintentional spread requires general communication for the increase of civic awareness.

Session 2 – New tools and approaches for detection and monitoring

CATFISHED: HOW METABARCODING DIET ANALYSIS INCREASES KNOWLEDGE ON PREDATION BY THE EUROPEAN CATFISH?

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Predatory fish can have considerable impacts on aquatic food webs due to their feeding behaviour and dietary preferences. Until very recently, most of the individual diet characterisation was based on traditional morphological stomach content analysis that presents limitations regarding prey identification and prey loss due to digestion or regurgitation. But, currently, metabarcoding of gut contents allows the identification of diet composition at a high taxonomic resolution, overcoming some of the limitations of the traditional morphological analysis. In this study, we compared the diet of the European catfish (*Silurus glanis*), an invasive top predator in Tagus river, by describing its diet throughout the metabarcoding of intestinal contents and traditional stomach content analysis based on fish prey morphology. A total of 185 catfish individuals was analysed enabling a comparison throughout its ontogeny and by season. Metabarcoding detected higher taxa richness than traditional analysis (23 vs 13, respectively), with some endangered native fish species being only detected using this method. The most common prey were shared between the two methods, including native migratory, endangered and economically valuable *Anguilla anguilla* and *Alosa* spp., native migratory *Chelon* spp., native *Luciobarbus* spp., and non-native *Lepomis gibbosus*. Seasonal differences were observed between methods in prey detection, being *Alosa* spp. detected in Winter and Spring using metabarcoding, but only in Spring with traditional analysis. Moreover, prey taxa richness was highest in Autumn with metabarcoding and in Winter with traditional analysis. Moreover, higher prey richness was observed in larger catfish only for the metabarcoding approach. Overall, metabarcoding was found to be important for assessing predation patterns of European catfish on fish communities that were missed through traditional analysis. Future studies on diet characterisation of invasive fish should include this tool, integrated with traditional gut content analysis, to better understand invasive fish impacts.

Session 1 – Risk assessment and management of invasive species

INCREASING KNOWLEDGE ABOUT *CORTADERIA SELLOANA* AND DIVERSIFYING STRATEGIES TO IMPROVE MANAGEMENT

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Pampas grass (*Cortaderia selloana*, Poaceae), an aggressive invasive alien plant, poses a significant threat to ecosystems, human health, and the economy. Two LIFE projects, STOP Cortaderia (2018-2022) and COOP Cortaderia+ (2023-2028), in the Iberian Peninsula and the South of France, have effectively tackled the management of this species through a successful combination of field interventions, scientific developments and engagement with the public and stakeholders. Although various aspects of pampas grass biology and ecology have been studied previously, some information pertinent to its management has remained elusive. At STOP Cortaderia, morphological and reproductive characteristics in female and hermaphrodite plants, flower development, seed longevity and germination under different conditions were analyzed. Female and hermaphrodite plants show similar vegetative characteristics and significant differences in relation to reproductive traits, with female plants being mainly responsible for dispersing the species, while hermaphrodite plants serve mainly as pollen donors, contributing to off-season allergies. The seeds typically ripen within three to four weeks of flowering onset and are dispersed by the wind for at least four months, although this duration can vary with weather conditions. The seeds show variable germination rates in different soils, water salinities and humidity conditions, but can establish in all the conditions analyzed. The seeds have no dormancy and have a short lifespan, ranging from one year in the field, with direct implications for follow up controls, to three years under optimum storage conditions, for example when they are used as indoor ornamental plants. The seeds are susceptible to destruction at temperatures of 40°C in dark conditions, indicating that composting is a safe destination for the removed panicles. These results have significant implications for the management of the species and will be considered in the COOP Cortaderia+ to increase effective control of the pampas grass invasion, including in advising the over 160 entities that have joined the Transnational Strategy to Combat Cortaderia, promoted by both projects.

Session 2 – New tools and approaches for detection and monitoring

EARLY DETECTION AND SIMPLY MONITORING OF ALIEN PLANT SPECIES WITH INVASIVE POTENTIAL THROUGH CITIZEN SCIENCE: APPLICATIONS THROUGH THE LIFE MEDCLIFFS NETWORKS

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LIFE medCLIFFS, is an EU-funded LIFE Nature project focused on the management of invasive alien plant species along the Costa Brava (northeastern Spain). Its primary goal is to improve the conservation status of the habitat HCI 1240, characterized by cliffs along the Mediterranean coast with endemic *Limonium* spp. Citizen science plays a pivotal role in the project through two networks that leverage iNaturalist: the Observers' Network and the Volunteers Network.
The Observers' Network gathers observations of 180 invasive or potentially invasive plant species, having recorded more than 5500 observations until May 2024. These observations will feed a database to produce risk maps which will allow us to predict the risk of invasion by a given species and area. Moreover, this network is also useful for the early detection of new occurrences of invasives not recorded until present in the study area.
The Volunteers' Network focuses on 33 highly invasive species, recording data in a series of 1-km transects that each volunteer has adopted. Based on the ca. 700 observations obtained in 2023, a simple, visually-attractive methodology for assessing the recorded populations has been developed, which is based on classifying them into any of the following three population dynamics categories: (1) propagative behavior (populations with seedlings or young plants but lacking senescent or deceased individuals); (2) senescent behavior (i.e., showing senescent/death plants but lacking seedlings/juveniles); and (3) a mixed behavior (i.e., with both). This methodology, whose outputs are easily interpretable as heatmaps, allows the collection of large datasets on invasive plants by citizen scientists, with two main applications: knowing which species are most worrisome based on simple, straightforward observations of their population dynamics; and identifying which sectors of the study area are more problematic and, thus, where management efforts should be directed.

Session 3 – Global change and invasions

EVALUATING ECOPHYSIOLOGICAL RESPONSES OF *CARPOBROTUS* SPECIES FROM DIFFERENT POPULATIONS AND GENOTYPES TO HERBIVORY BY THE MEDITERRANEAN SAND SNAIL *THEBA PISANA*

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Carpobrotus is a genus of plants that includes over 12 species, most of which are native to South Africa. Invasive plant populations of three of them (*C. Acinaciformis*, *C. chilensis* and *C. edulis*) are among the most detrimental to the conservation of coastal habitats in the areas where they have been introduced. Their invasiveness is attributed to high phenotypic plasticity, which favors their competitive ability and stress tolerance. However, little is known about the role of enemy release in their growth, comparing genotypes of different provenances. To investigate this, we conducted a greenhouse experiment with plants from eight populations of different regions (South Africa, Southern Europe, New Zealand, and the USA). According to Novoa et al. 2023, three of these populations belong to one genetic cluster, three to a second genetic cluster, and the other two are hybrids between these clusters. We aimed to explore how *Carpobrotus* sp. pl. from multiple populations respond to herbivory by the snail *Theba pisana*. Our results showed no significant differences in aboveground biomass growth among the different populations, regardless of genetic ancestry, provenance, or exposure to snail attack. In contrast, for both genetic clusters, we found that root growth was coincidentally higher in those populations with a higher effective number of alleles, regardless of provenance or whether they were exposed to snail attack. Furthermore, hybrid populations from Italy (introduced) showed higher root growth, expressed in increased biomass and length, than hybrid populations from South Africa (native). Our results suggest a tolerance to attack by this generalist snail across the studied *Carpobrotus* species. *Carpobrotus* populations have different root growth patterns, suggesting that some populations may have a higher competitive ability due to the production of more vigorous roots, intriguingly coinciding with higher allelic diversity.

Session 5 – Conservation issues and biological invasions

MONITORING OF REMOVED *CARPOBROTUS* SP. PL. AREAS BY EVALUATING PLANT-HERBIVORE INTERACTION DATA FROM TWO CONSECUTIVE SPRINGS

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Coastal areas are currently facing significant ecological disturbances due to the spread of the invasive plant species *Carpobrotus* sp. pl. In response, management programs have been initiated at several locations along the northwestern coast of the Iberian Peninsula to eradicate patches of *Carpobrotus*. Although previous studies have assessed the recovery of the plant community and arthropods such as arachnids and beetles, the effect on plant-herbivore interactions has not been fully understood.
To address this, we examined the effects of *Carpobrotus* sp. pl. removal on the restoration of plant-invertebrate herbivore interactions after two years of monitoring. During two spring seasons (2022 and 2023), we collected data using standard quadrats (0.5 x 0.5 cm) on vegetation cover, plant and invertebrate herbivore species richness, invertebrate herbivore abundance and recorded antagonistic interactions at six coastal locations (three coastal dunes and three coastal shrublands) divided into three categories based on their condition: invaded, non-invaded, and removed plots. For the interactions, we analyzed some network-level (e.g., modularity) and species-level parameters (e.g., herbivore specialization).
Considering modularity, our results suggest that the removal of *Carpobrotus* sp. pl. from coastal shrublands is positive after five to six years of succession (plants were removed in 2018-2019 by volunteers), as the observed trend is maintained over the two years of monitoring. This means that the removed plots are structurally more similar to the native plots than the invaded ones. However, we found the opposite for the coastal dunes, as the removed plots became more similar to the invaded plots in the second year of monitoring (due to the resprouting of *Carpobrotus* sp. pl.). Therefore, based on these results, land managers and authorities should be contacted to remove the invader and conduct regular monitoring to prevent small fragments that have not been completely removed from re-establishing in these areas.

Session 2 – New tools and approaches for detection and monitoring

BIOTIC RESISTANCE TO PLANT INVASIONS IN THE CANADIAN NORTH

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Biological invasions are an emerging threat in northern biomes, with potential consequences for biodiversity, ecosystem function, and the economy. While such invasions are increasingly frequent in areas disturbed by human activity, few non-native species have colonized undisturbed areas.

The town of Churchill, MB presents a notable example of this trend; invasive plants have been present within town borders for decades but are absent from the surrounding boreal forest and tundra biomes. This pattern may be explained by the presence of native ground cover, which could limit access to soil and other resources required for invader establishment. My research aims to determine if ground cover in the Churchill region is capable of resisting invasions, and if its removal through human disturbance increases the ecosystem's susceptibility to colonization.

To achieve the above goal, I have established field experiments in Churchill. Utilizing mesocosms, I am examining the effects of various mosses and lichens – as well as *Dryas integrifolia* (a native vascular plant) – on germination, survival, and growth of invasives, in both the tundra and boreal forest biomes. Additionally, I have established complementary greenhouse experiments at the University of Toronto Mississauga. These experiments examine effects of ground cover on invasion success under controlled conditions, and the effect of moisture as a potential explanatory mechanism. Contrary to expectations, ongoing results suggest that non-native plants are capable of germinating in presence of ground cover, with different native species exhibiting variable effects on their success rates.

Northern regions are currently the fastest warming areas on earth, making them particularly susceptible to species invasions. As one of the first experimental tests of how interspecies interactions affect such invasions, my research is both novel and impactful. A better understanding of these interactions will inform conservation practice, potentially placing increased emphasis on protecting native species.

Session 1 – Risk assessment and management of invasive species

RECENT UPDATES AND INSIGHTS ON THE DIVERSITY PATTERNS OF MARINE NON-NATIVE SPECIES IN THE ARCHIPELAGOS OF MACARONESIA

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The present study is an update on the Macaronesia region's first marine Non-native species (NNS) listing. Non-native species are constantly arriving and being documented, making it relevant to revise the current state of marine species introductions since the publication of Castro et al. (2022). Two hundred and seventeen (217) marine non-native species (NNS) were recorded for the whole of Macaronesia, including 41 Range Expansions (RE), which represents an increase of 27 species since the previous listing. The highest NNS richness was registered in the Canary Islands (128 species; 97 NNS and 31 RE), followed by the Azores (98 species; 93 NNS and 5 RE), Madeira (84 species; 60 NNS and 24 RE), and finally Cabo Verde (35 species; 33 NNS and 2 RE). In this update, there was an increase in the number of range expansion species, suggesting a clear sign of the ongoing tropicalization process that the region is undergoing, particularly in the Canary Islands and Madeira. The number of non-native taxa in Macaronesia, namely fishes (Vertebrates) and macroalgae, continued to rise in recent years. However, the main patterns remain the same. Finally, this continuous rise in the number of NNS in Macaronesia should be taken seriously by regional policy and decision-makers and highlights the need to implement biosecurity protocols to avoid ecological and economic consequences.

Session 6 – Pathways and dispersal of invasive species

SOLEN MARGINATUS IN THE AZORES - A RECENT NON-NATIVE SPECIES

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The species *Solen marginatus* was recently found on Terceira Island (Azores). A small population was identified within the Praia da Vitória marina with no records outside that area. The distribution of the species extends from the North Sea, through Atlantic Europe and the Mediterranean coasts to the coasts of Mauritania. Two important issues related to invasions are firstly, identifying the origin of the species and secondly, the ability of this species to spread throughout the non-native territory. In this work we sought to answer these two questions: finding the potential origin of the population in Praia da Vitória and whether it would have the capacity to spread throughout the archipelago, like other species of molluscs. Assuming that the main transport route would be ballast waters and hull fouling of recreational boats, vessel traffic records from the Praia da Vitória marina were used. It is suggested that this species came from the coasts of mainland Portugal. Individuals were captured on site and measurements were taken which revealed the existence of adults over two years of age, with the population remaining stabilized in the same area. *Solen marginatus* inhabits lagoons and estuaries, and the Praia da Vitória marina communicates with a brackish water wetland, which influences the salinity of the place where the population exists and probably maintains the conditions for its existence, with no potential for expansion away from the current location.

Session 6 – Pathways and dispersal of invasive species

TEMPERATURE AND SALINITY TOLERANCE ASSESSMENT OF *PHYMACTIS PAPILLOSA* (LESSON, 1830), A POTENTIALLY INVASIVE SEA ANEMONE SPECIES, THROUGH MESOCOSM EXPERIMENTS

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Biological invasions typically unfold through four fundamental stages (Blackburn et al., 2011): transport, introduction, establishment, and spread. The ecological and biological traits influence the likelihood of successful introduction for certain species within specific taxonomic groups. Cnidarians have several characteristics that are particularly suitable for a successful invasion. The first invasion stage (transport) is already accomplished when a NIS species is identified. *Phymactis papillosa* (Lesson, 1830) is a sea anemone species recently identified on the Portuguese rocky intertidal coast (Pereira et al., 2022). It is a Pacific South American intertidal sea anemone species with no other known records outside its native range. Its abundance is increasing in Portugal (Pereira et al., 2022), but there is no information about its invasiveness.
The goal of this investigation is to assess the tolerance of *P. papillosa* to temperature and salinity through mesocosm experiments. Approximately 450 *P. papillosa* individuals were used in a two-factor experimental design, using five different temperature treatments (15, 19, 23, 27, 31°C) and three salinity conditions (32, 35, 38 psu), each one replicated five times. The salinity and temperature values reflect the variation observed in coastal environments in Portugal, including coastal lagoons (Newton & Mudge, 2003). Levels of mortality and pedal disc diameter variation after a two-weeks period were measured.
Results show that mortality isn't impacted by salinity, but temperature has a significant effect on mortality. At 31°C, 100% of the individuals perish, with an intermediate level of mortality at 27°C and 0% at 23°C or less. These results indicate that *P. papillosa* has the potential to invade the Portuguese lagoons and the northern coast of the Iberian Peninsula and the North Sea, but the high temperatures of the Mediterranean seem to constitute a physiological limit for the species.

Session 1 – Risk assessment and management of invasive species

ULMUS PUMILA AS AN INVASIVE ALIEN SPECIES IN UKRAINE

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In the present study, we analyzed data about the pathways of introduction, current distribution and invasive success of *Ulmus pumila* in Ukraine. The first centers of cultivation of Siberian elm were the Kyiv University Botanical Garden (since 1893) and the Oleksandria Arboretum (since 1917), probably the wildness that occurred in the mid-20th century. The current distribution of Siberian elm is sporadic across most of the territory, mainly concentrated in the South of Ukraine. Approximately 200 localities have been recorded. Common near cultivated areas, also along railways and highways, forest stripes, parks, forest, fallow lands, etc. Active distribution of *U. pumila* has been observed in the Steppe zone of Ukraine since 1970. Often together with other alien species. e.g. Acer negundo, Gleditsia triacanthos and Elaeagnus angustifolia, *U. pumila* form dense thickets. The widespread of trees, in particular Siberian elm, contributes to the spontaneous afforestation of the steppes. In the Steppe zone of Ukraine the grasslands prevail and spontaneous afforestation is a threat for treeless ecosystems like the steppe. The most typical plant communities with the participation of *U. pumila* belong to 5 classes of vegetation (Rhamno-Prunetea, Festuco-Brometea, Robinietea, Artemisietea vulgaris, Galio-urticetea). The largest projective coverage of *U. pumila* has been noted in the communities of classes *Robinietea* and *Artemisietea vulgaris*. Probably due to its demanding light regime, Siberian elm rarely occurs in forests, but often enters artificial pine plantations. The expansion of *U. pumila* causes overgrowth of steppe areas with plant communities of the Cl. Festuco-Brometea on the territory of Protected Areas as for Striltsivsky Steppe and Yelanetsky Steppe Nature Reserve, etc. The formation of dense thickets and the spontaneous afforestation of the steppes, CSR strategy, high significance of I-Rank (92) for the Steppe zone and Medium significance of I-Rank (75) for the rest of the territory there are main peculiarities of *U. pumila* in Ukraine.

Session 6 – Pathways and dispersal of invasive species

COMPARATIVE STUDY OF INVASIVE ALIEN PLANT SPECIES IN THE FLORA OF UKRAINE AND POLAND

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The scope of the study is to synthesise Polish and Ukrainian approaches to the establishment, spread, and role of alien plant species in the flora of both countries, with particular emphasis on invasive ones, against the background of the biogeographical differences between the two countries. We focused on assessing the participation of invasive alien species of plants (IAS-P); identifying the pathways of their introduction and spread; evaluating the degree of dissemination of selected IAS- in analyzed countries; and the degree of invasiveness of selected IAS-P with different statuses in the floras of Ukraine and Poland. In general, four groups of invasive alien species can be distinguished: i) highly invasive species in both countries (8 species: *Acer negundo*, *Ambrosia artemisiifolia*, *Echinocystis lobata*, *Heracleum sosnowskyi*, *Impatiens parviflora*, *Reynoutria japonica*, *Robinia pseudoacacia*, *Solidago canadensis*); ii) species with a high status of invasiveness in one country and less or unknown in another (20); iii) species which are moderately or potentially invasive in both countries (5); iv) species whose status in one of country requires clarification and additional research (6). Among selected species, 7 are on the current list of species posing a threat to the EU, while 3 are included on the list posing a threat to Poland (a member state). It was found that some of the studied species in the both countries or botanical and geographical zones have varied statuses, e.g., *Grindelia squarrosa* and *Ulmus pumila* in the Steppe zones of Ukraine are highly invasive species instead in Poland, the first species is locally established and the second one so far does not spontaneously occur in Poland. Information on how and why alien species are introduced to new regions provides the foundation for pre- and at-border management strategies that aim to prevent the introduction of alien species.

Session 5 – Conservation issues and biological invasions

MONITORING OF BIOCONTAMINATION: THE CASE OF NON-INDIGENOUS AMPHIPOD ASSEMBLAGES ACROSS LEVELS OF HUMAN PRESSURES

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Marinas are hot spots of non-indigenous species (NIS). The high surface of artificial hard structures in these habitats promotes the establishment of macrofouling communities, which could hold NIS. Although most of the NIS studies in marinas have been typically focused on sessile taxa, their associated amphipod assemblages (Crustacea: Peracarida) have also been proposed to monitor the biocontamination in these habitats. In order to evaluate the level of biocontamination, a set of roughened polyvinylchloride (PVC) settlement panels were placed on seven marinas with different levels of human pressures (low, mid and high) across Ría de Vigo (NW Iberian Peninsula). Macrofouling communities established on PVC panels were collected three and nine months later to study two stages of maturity and their associated amphipod assemblages were sorted and identified. A total of 29775 individuals belonging to 41 species of amphipods were found, including the NIS *Caprella mutica*, *Ericthonius pugnax*, *Jassa slatteryi* and *Aoroides* sp. Univariant analyses showed significant differences in NIS abundance among the marinas and periods, but not for the number of NIS. Furthermore, the site-specific biocontamination index (SBCI) based on the relative number of NIS and their abundance was applied in both periods of the different locations. Our results indicated high and severe levels of biocontamination in six of the seven locations, even in those subjected to low human pressures. Additionally, SBCI increased as the community matured over time, except in one locality where the biocontamination was similar. Therefore, the present study points out the fast colonization and high relative contribution of non-indigenous amphipods in marinas macrofouling communities, even in low anthropized localities. These facts should be taken into consideration in the management programs of Ría de Vigo, especially in those localities considered pristine.

Session 1 – Risk assessment and management of invasive species

VALORIZING THE INVADERS: PRESENTING THE VALIAS PROJECT

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Biological invasions are globally acknowledged as a major driver of biodiversity loss, as well as strongly affecting ecosystem services and human health. In economic terms, and in the Mediterranean Sea alone, the gross marine invasions' costs have risen up to 30 billion USD over the last three decades. Yet, not all invasive alien species (IAS) have negative economic effects, as some of those can be exploited. Within VALIAS project we aim towards coupling the management of IAS with the growing demand for marine derived-products.

The main objective of the project is to develop new valorization pathways of IAS, by creating new strategies towards their population management and preservation of European marine biodiversity, ultimately turning the current problem of potential marine IAS into a "Win-Win" solution both for European fisheries and for the companies active in the sectors of aquaculture, nutrition and cosmetology. Moreover, it is expected that the results of the project will provide innovative solutions to cover the consumers' demand for chemical free, high quality, natural and sustainable products, whilst empowering and improving the productivity of European fisheries, aquaculture, food and cosmetic sector with environmental, economic and social acceptance. These goals will be addressed over a time-span of 48 months, organized in seven work packages (WPs) and 16 deliverables. Researchers and scientific staff from a total of eight Partners of five European countries (namely Greece, Cyprus, Italy, Ireland and Bulgaria) will take part into 318 secondment months.

Acknowledgements: This project has received funding from the European Union's Horizon Europe Framework Programme (HORIZON) under the Marie Skłodowska-Curie grant agreement No 101131441.

Session 1 – Risk assessment and management of invasive species

LEVERAGING STAKEHOLDER EXPERTISE TO ENHANCE MARINE NIS MANAGEMENT

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The detection of marine non-indigenous species (NIS) is rising globally, including in the Portuguese archipelagos of the Azores and Madeira. Alongside monitoring techniques for early NIS detection, citizen science initiatives have proven to be a valuable complementary tool for assessing the abundance and distribution of these species. However, stakeholders' knowledge should not be limited to reporting NIS presence; it can be integrated into the development of decision-support tools in ecosystem management. In this context, this work illustrates a series of case studies conducted in the two Portuguese archipelagos, where stakeholders' expertise - including NIS baseline knowledge; perception of NIS associated problems and, user habits - was leveraged to develop management models that prioritize actions to control NIS spread and promote the conservation of marine habitats.

The first case study describes a predictive model to assess the risk of NIS secondary spread by identifying high-risk areas and pathways. Input variables were collected from questionnaire surveys addressed to local stakeholders and from environmental monitoring data.

The second and third case studies integrate local communities' habits and expert knowledge to produce a cost-efficient early detection method for NIS dispersal. Specifically, the occurrence of *Sparus aurata* and *Chilomycterus reticulatus* were assessed by involving citizens in GIS participatory mapping and data collected from recreational fishing contests.

The last case study presents a predictive model to assess which factors forecast stakeholder participation in NIS management actions. Data were gathered by face-to face survey questionnaires administered in recreational marinas of São Miguel (Azores) and Madeira islands.

Results from these case studies suggests the implementation of guidelines and good environmental practices to minimize the risk of NIS spread, with the involvement of local communities, and contribute to the implementation of Target 6 of the Kunming-Montreal Global Biodiversity Framework.

Session 1 – Risk assessment and management of invasive species

FUSARIUM AND *NIGROSPORA* – POTENTIAL BIOLOGICAL CONTROL AGENTS AGAINST *CENCHRUS SETACEUS*?

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The introduction of invasive alien plant species is one of the main threats to the diversity of the insular ecosystems. *Cenchrus setaceus* (Forssk.) Morrone is the major alien species in the Canary Islands. Single use of conventional mechanical control techniques indicates low efficiency, and the use of synthetic chemicals is highly questioned due to environmental concerns. Thus, a search for biological control agents as facultative fungal pathogens was conducted. In a field assay in Gran Canaria Island, two native fungal strains of F*usarium* sp. And *Nigrospora* sp. were artificially inoculated by spray into adult plants with or without pelargonic acid as physiological stressor. Assessments were done using biometrical parameters and symptoms of 22 inflorescences, 440 fascicles and one hermaphrodite flower per fascicle. Two fungal isolations were performed using lemma, palea and gynoecium of normal and abnormal panicles. The abnormal colour of the inflorescence and fascicle (white-violet, golden-brown and white) was associated with a lower length of panicle, number of fascicles and spikelets ($p<0.05$). Treatment applications were associated with the golden-brown colour of the fascicle ($p<0.05$). Treated flowers of abnormal inflorescences presented the highest values of symptomatic organs - abnormal colour of the spikelet, abnormal style and mycelium presence in gynoecium ($p<0.05$). *Nigrospora* sp. was isolated from all symptomatic organs ($n = 54$) in all treated and untreated plant samples, while *Fusarium* sp. was detected in 50% of the samples. Treated plants with *Fusarium* sp., *Nigrospora* sp. And pelargonic acid showed higher number of symptoms of the inflorescences compared to control and the rest of the plants treated only with fungal consortium or pelargonic acid ($p<0.05$). The symptoms described and evaluated in this study contribute to future assessments on health status of the inflorescences and floral organs of *C. setaceus*.

Session 5 – Conservation issues and biological invasions

ORIGIN, EXPANSION, AND ESTABLISHMENT OF A HIGHLY INVASIVE GASTROPOD IN THE FRESHWATER ECOSYSTEMS OF MADEIRA ISLAND (NE ATLANTIC)

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The New Zealand mud snail *Potamopyrgus antipodarum* is a highly invasive species established on almost all continents, including Europe. Initially detected in the freshwater ecosystems of Madeira Island (Macaronesia region) in 2017–2018, we investigated its expansion and establishment in this region. In 2023, visual inspections of the substrate in 33 sites across 16 streams were conducted and compared with previous macroinvertebrate checklists. While previous evidence suggests initial introduction on Madeira's northern shore, our findings suggest it has spread to the south region and upper streams, having now well-established populations in initial invaded locations. This study is the first evidence of the vast geographical distribution and expansion of *P. Antipodarum* on Madeira Island, possibly making Macaronesia's first invaded oceanic island and the westernmost European distribution range for this invasive species. The introduction's origin and vector are currently being assessed recurring to mitochondrial DNA analysis of specimens collected in 11 streams.

Session 5 – Conservation issues and biological invasions

ASSESSMENT OF NEOZOAN BULLFROGS (*LITHOBATES CATESBEIANUS*) AS RESERVOIR HOST OF ENDOPARASITES IN GERMANY: IMPLICATIONS FOR CONSERVATION AND PUBLIC HEALTH

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The American bullfrog (*Lithobates catesbeianus*), native to North America, has emerged as a global ecological threat due to its introduction as an invasive species in the 20th century in Europe including Germany. Their robustness, rapid reproduction, and adaptability have facilitated their invasive success in new environments. Their voracious appetite and adaptability might result in transmission of endoparasites. Thus, they might play a crucial role as a reservoir host of emerging infectious diseases, and thereby acting either as definitive hosts (DH), intermediate hosts (IH) or paratenic hosts (PH). Their potential to spread infectious diseases contributes to the decline of native amphibian populations globally. These neozoans are known to harbor more than 129 different helminth taxa and several species of protozoa. In this study, we investigated the presence of endoparasites in bullfrogs captured in the north of Karlsruhe, Germany, between 2020 and 2023. A total of 13 adults, 13 juveniles, and 13 tadpoles were subjected to necropsy and examined for parasites using standard native faecal smear techniques, combined sedimentation-flotation method, histological analysis, pepsin digestion method, specific coproantigen *Giardia intestinalis* ELISA and acid-fast staining for detection of Cryptosporidium-oocysts. Ongoing parasitological analyses have revealed that 10 out of 13 adults harbored encysted helminths, most likely *Balysascaris* sp.- and *Contracaecum* sp.-like larvae, observed both macroscopically in stomach mucosa as well as small intestine walls and histology in hematoxylin and eosin-stained slides. Additionally, one juvenile specimen exhibited pseudoparasites from a prey animal. G. intestinalis-antigens were detected in three tadpoles so far. These preliminary findings highlight the importance of monitoring invasive bullfrogs for potential disease transmission and investigating their role as IH-, DH-, and/or PH for zoonotic parasites, underscoring the need for proactive management strategies to lessen their impact on native amphibian populations and public health.

Session 2 – New tools and approaches for detection and monitoring

DIGITAL NECROMANCY: BRINGING LOST ONLINE INFORMATION BACK TO LIFE

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Emerging fields of iEcology and conservation culturomics offer a great opportunity to advance the understanding of biological invasions. They also bring some new challenges. One of them is the temporal instability of digital data. Websites or posts on social media get deleted, or access to them is hampered by changed policy. Luckily, accessible web content gets archived and can be retrieved retrospectively on a large scale via publicly available APIs. To demonstrate the potential of using archived digital data, we developed a simple wrapper for R programming language and extracted archived versions of a predominantly North American community-based database of ornamental plants that can be traded (Dave's Garden). To do this, we used two different sources – Wayback Machine and Common Crawl. The data retrieved included information on almost 4000 plant species from the Global database of Naturalised Alien Flora (GLoNAF) database and over 1500 plant species that are recorded as alien in the United States Register of Introduced and Invasive Species (US-RIIS). Some taxa were archived repeatedly with time, offering a unique time series of changing offer and demand of these plants during the studied period.

Session 6 – Pathways and dispersal of invasive species

OLD MANOR PARKS AND DENDROLOGICAL PLANTATIONS – THE MAIN SOURCE OF THE SPREAD OF INVASIVE WOODY PLANTS IN THE BALTIC STATES

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Manor parks and urban green areas in the Baltics, established primarily in the 19th century, boast a diverse collection of woody plants. Introduced for aesthetic reasons, many have become naturalized within the park landscapes. However, this naturalization presents a potential ecological challenge: some well-adapted species can become invasive, threatening the integrity of native plant communities.
A recent study (2018-2023) investigated this potential threat across 60 parks in Estonia, Latvia, and Lithuania. Encompassing the full range of winter hardiness zones (5a to 8a) found in the Baltic region, the survey methodology focused on both the core park areas and a 50-meter buffer zone to capture naturalized trees beyond the park boundaries. Researchers employed a standardized method to assess the frequency of invasive species occurrence within each park.
The survey identified a total of 101 naturalized species, with a significant portion (84) being trees and shrubs. The most frequently encountered invasive species included common ornamentals like *Syringa vulgaris*, *Spiraea chamaedryfolia*, *Symphoricarpos albus*, and *Sorbaria sorbifolia*.
Intriguingly, the analysis revealed a two-fold influence on the spread of invasive woody plants: winter hardiness zones and park maintenance practices. The study found a positive correlation between winter hardiness and the number of established invasive species. Parks located in milder zones (higher hardiness zones) exhibited a greater prevalence of naturalized invasive plants compared to those in lower hardiness zones. However, park maintenance emerged as a crucial factor in mitigating the spread of invasive woody plants. Well-maintained parks, characterized by practices such as regular mowing, displayed a demonstrably lower frequency of invasive species. This suggests that targeted park management strategies, particularly those focused on controlling vegetative spread, can be instrumental in suppressing the establishment and proliferation of potentially invasive naturalized woody plants such as *Spiraea* or *Sorbaria*.

Session 1 – Risk assessment and management of invasive species

DIOSPYROS VIRGINIANA A NEGLECTED SPECIES BUT WITH INVASIVE POTENTIAL FOR THE NEAR FUTURE IN ITALY

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The American persimmon (*Diospyros virginiana* L.) is an arboreal species, so far little reported in Europe (England), but which has recently been observed in two regions of Italy, in Tuscany on the island of Elba (Galasso et al. 2017) and in Sicily on Etna (Musarella et al. 2024). It is a species that produces seeds and can easily grow from root shoots forming extensive populations. It was introduced as a rootstock for the Diospyros kaki but if the cultivation is abandoned the rootstock can take over and spread in abandoned land, roadsides etc. with numerous individuals. This ability has recently been highlighted for Sicily where further observations have highlighted its important diffusion not only on Etna, at altitudes between 100-800 m above sea level, but also in south-western Sicily with a drier climate near coastal areas. Research and mapping are underway at other sites on the island and in peninsular Italy. The diffusion capacity has so far been underestimated, but from a preliminary risk assessment it seems important with the potential to become an invasive species in the next future. Therefore, it should be kept under close attention for the next few years with monitoring activities.

Galasso G (2017) Notulae to the Italian Alien Vascular Flora: 4. Ital. Bot 4, 33–41. https://doi.org/10.3897/italianbotanist.4.21666.
Musarella CM et al. (2024) New Alien Plant Taxa for Italy and Europe: An Update. Plants 13: 620. https://doi.org/10.3390/plants13050620

Session 5 – Conservation issues and biological invasions

FEEDING ECOLOGY OF INVASIVE MOZAMBIQUE TILAPIA IN THE BHIMA RIVER, INDIA: A METABARCODING AND GUT CONTENT ANALYSIS

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Biological invasions are among the most detrimental factors responsible for destroying native flora and fauna in ecosystems. Invasions cause severe damage through competition, nutrient cycling disruption, predation, and disease spreading. Controlling such invasions is crucial to minimize environmental adversities. Studying invasive species in the context of their place in the food web helps us understand their influence on ecosystems. This study aims to assess the diet of Mozambique tilapia (*Oreochromis mossambicus*), a species with a high population in the Bhima River, a major tributary of the Krishna River system, India. Both juvenile and adult Mozambique tilapia gut contents were analyzed using DNA metabarcoding and traditional gut content analysis. DNA was extracted from gut contents, and the COI gene region (~550 bp) was amplified. PCR products were used to prepare libraries, and sequencing was performed on the Illumina MiSeq platform. Raw data were analyzed to identify the classes of organisms ingested by the tilapia. The taxonomic distribution revealed arthropods as the predominant taxa, followed by rotifers and Cnidarians. Juvenile fish showed a higher presence of Ascomycota and Zygomycota fungi, while adult fish had a significant presence of Cnidaria. These findings provide crucial information to understand the ecological consequences of Mozambique tilapia invasion in freshwater ecosystems. Understanding the dietary habits of this invasive species provides insights into their impact on native biodiversity and ecosystem functioning. The data gathered will assist in developing strategies to mitigate the impact of Mozambique tilapia on freshwater ecosystems.

Session 2 – New tools and approaches for detection and monitoring

NON-INDIGENOUS SPECIES (NIS) IN RECREATIONAL MARINAS OF NORTH PORTUGAL. DO DIFFERENT CONDITIONS MEAN DIFFERENT NIS COMPOSITION?

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Man-made structures such as recreational marinas are a common driver of change in the coastal realm. Recreational marinas alter the original environmental conditions shaping native communities. They are known to be key points for the introduction and secondary spread of non-indigenous species (NIS). NIS establishment tends to be greater in brackish habitats than in coastal ones due to the natural and anthropogenic disturbances that occur in estuarine ecosystems. However, few studies have shown higher abundances and richness of NIS in estuarine marinas. Furthermore, little is known about the influence of salinity on the diversity of fouling assemblages. In the framework of the project 'Marina-Forests' (http://doi.org/10.54499/2022.06806.PTDC), fouling animals associated with floating pontoons were studied in 6 recreational marinas of North Portugal in May 2023: 3 correspond to coastal areas and 3 are located in estuarine environments. A total of 200 taxa belonging to 11 phyla were found, of which 16 species (8%) are considered NIS in the Iberian Peninsula. Among the latter, 9 species are cryptogenic (5%) and 7 are alien (4%). NIS were mainly represented by Arthropoda and Bryozoa (7 species each) followed by Annelida and Cnidaria (1 species each). Depending on salinity, NIS richness was higher in coastal marinas than in estuarine ones (11 vs 6 species, respectively). Nevertheless, NIS/Native richness percentage was slightly greater in estuarine marinas than in coastal ones (9% vs 7%, respectively). According to mobility traits, NIS constituted 5% of mobile epibionts in estuarine marinas and 4% in coastal ones. On the other hand, fouling sessile NIS abundance was slightly greater in estuarine marinas (14%) than in coastal ones (10%). This study provides, for the first time, data on native and NIS species richness in coastal and estuarine marinas of North Portugal, which could be useful for developing NIS monitoring programs.

Session 6 – Pathways and dispersal of invasive species

UNDERSTANDING INVASIVE SPECIES SPREAD: INSIGHTS FROM EUROPEAN STUDY CASES

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The global movement of invasive species across countries and regions is primarily driven by human activities, particularly through the transportation of goods and tourism. However, ecological constraints within specific niches also play a role in shaping and limiting these movements. Furthermore, targeted management strategies aimed at preventing and controlling the introduction of new invasive species can significantly impact their spread into different regions. In this comprehensive study, we systematically examine the invasion dynamics in Europe over time, focusing on specific case studies such as the Asian hornet (*Vespa velutina*), the raccoon (*Procyon lotor*) and zebra mussel (*Dreissena polymorpha*). By analyzing yearly patterns of species movement in relation to human activities (such as imports of goods and services, GDP, tourism, population density) and specific ecological limitations (using both global and local climate suitability models) we gain deeper insights into historical and potential dispersal trajectories. Furthermore, by considering management interventions, including preventative measures implemented by various countries over time, we can assess the role of such strategies in regulating the arrival of invasive species. Understanding the underlying mechanistic properties of dispersal pathways is paramount for scientists and managers seeking to mitigate or prevent future organism movements.

Session 1 – Risk assessment and management of invasive species

PATTERNS OF SPECIES RICHNESS OF INVASIVE ALIEN PLANTS IN THE MUNICIPALITIES OF MAINLAND PORTUGAL

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Mainland Portugal harbors at least 770 alien plant species of which ca. 100 are considered invasive. While previous works have assessed the distribution of some species, the distribution patterns of invasive plants in the country remain largely unknown. In this work, we mapped the species richness of known invasive plants across mainland Portugal and analyzed distinct aspects of their spatial distribution. We used municipalities as units of analysis aiming to support decision-making in management. We compiled occurrence records for 98 terrestrial and aquatic vascular plants included in the list of invasive alien species of Union concern (Regulation EU No. 1143/2014) and the Portuguese national list (Decree-Law No. 92/2019). Seven different sources were used for data compilation, resulting in ca. 108000 presence records. A generalized least squares regression model was used to assess relationships between the richness of invasive species and a set of 28 variables representing environmental and human factors. A k-means clustering analysis was performed to identify groups of species exhibiting similar distributions. All mainland Portuguese municipalities have records of invasive alien plants. Littoral municipalities, with higher accessibility to major urban centers of national or regional relevance, have significantly higher invasive plant richness. In addition, higher values of municipality area, sampling effort, density of protected areas, and number of plant nurseries and aquarium stores, showed a positive association with the number of invasive plant species. Four groups of species were identified based on their distribution patterns: widespread species, moderately widespread, species primarily found along the littoral, and species with narrow ranges. Generally, littoral municipalities and those near urban centers in mainland Portugal face increased pressure from plant invasions. To mitigate the impacts of the ongoing spread of invasive plants, national and local-level prevention and monitoring initiatives should primarily focus on these areas.

Session 2 – New tools and approaches for detection and monitoring

DO INVASIVE ALIEN SPECIES SHARE SIMILAR CHARACTERISTICS ACROSS DIFFERENT TAXONOMIC GROUPS?

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Species traits are determinant along the different invasion stages. Invasive alien species traits have been used across different taxa and ecosystem types to establish relationships between functional responses and impacts on the invaded ecosystems. Although plants, fish, birds, and invertebrate traits have been studied worldwide to identify common traits associated to their invasion success, there is a lack of consistency on predictors that influence species invasion success across different taxonomic groups. A list of selected plants (53), birds (28), insects (19) and freshwater fish (50) invading the Iberian Peninsula were selected to investigate traits typologies associated with species success. More specifically, i) biological features, ii) introduction event details and iii) ecosystem properties. Generalized linear models (GLMs) and multivariate analysis were used to identify traits associated to the success or failure of invasion.

Some of these traits were common to all taxonomic groups but for other traits there was only partial or no correspondence between groups. A Principal Coordinates Analysis (PCoA) of the species traits showed an overlap between species that were successful and species that failed the invasion process and a PERMANOVA analysis indicated no significant differences between them, for all different taxonomic groups. Furthermore, the preliminary results of the GLMs have not clearly established which traits are more important for achieving a successful invasion for most of the taxonomic groups. These results show that, although there are traits commonly associated with the success of invasive species, such as the duration of the life cycle, fecundity or biogeographic origin, the ecological interactions between species, the introduction vector, and especially the characteristics of the recipient ecosystem result in a highly complex process, which makes it difficult to identify common traits and causes for invasion success.

Session 4 – Socioeconomic impacts of invasions

PUBLIC AWARENESS AND PERCEPTIONS OF INVASIVE NON-NATIVE SPECIES IN THE UK

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Invasive non-native species (INNS) are one of the main drivers of biodiversity loss globally. Public awareness and perceptions are critical to the successful management of INNS impacts. However, measuring awareness and perceptions using traditional methods, such as surveys, has historically been limited by financial and time constraints. Conservation culturomics - the use of digital data to assess human-nature interactions - can provide a cheap and efficient solution to these constraints. We used Google Trends to assess the relative search volumes in the UK, from 2009 to 2023, of 61 INNS which have been risk-assessed by the GB Non-Native Species Secretariat. For scientific name searches, the most-searched INNS was the edible dormouse (*Glis glis*). For common names, it was Japanese knotweed (*Reynoutria japonica*). Search volumes for scientific names were not correlated with those for common names. Factors influencing search volume may include the length of a species' names, the date of its introduction into the UK, its UK distribution, or the taxonomic identity of the species (e.g., carnivores seemed to be searched for more often). To understand what drives relative search volume and confirm its validity as a measure of public awareness, we compared Google Trends data to other types of digital data, such as data obtained from social media platforms. To assess the role of familiarity and encounters with INNS, we also compared internet search locations to INNS distributions across the UK. Correlation between relative search volume and INNS distribution suggests a potential for increases in local relative search volumes to be used to predict the spread of INNS to new regions. Understanding what drives public awareness of INNS is vital to ensure public support for INNS reporting, containment and eradication programmes to limit biodiversity loss.

Session 3 – Global change and invasions

URBAN EVOLVED INVASIVE PLANT TOLERATES EXPERIMENTAL CLIMATE CHANGE

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Urban areas are prevalent and increasing globally, and they are hotspots for introduction and establishment of non-native invasive species. Unique urban conditions are hypothesized to drive evolution of invasive species, and urban evolved invaders are predicted to be more tolerant of climate change. We tested these two hypotheses using the widespread European plant invader *Erigeron annuus* as a model. Urban sites in Zagreb, Croatia had lower soil moisture, were hotter, and had more impervious surface than adjacent rural sites. Invasive plant height at the field sites was negatively related to percentage impervious surface, indicating more adverse growing conditions at more urbanized sites. Under control conditions in a growth chamber experiment, plants grown from seed collected at more urbanized sites had lower biomass than those from more rural sites, suggesting population evolution towards a more conservative growth strategy. However, urban populations were relatively unaffected or were less negatively affected by warming, drought, and warming + drought treatments compared to controls, whereas rural populations were consistently smaller across all treatments. There was a less negative effect of treatments on plant biomass in the experiment for populations from field sites with greater percentage impervious surface, demonstrating that populations from more urbanized sites had adapted to hotter and drier urban site conditions. Our results show that invasive plant populations have evolved in response to urban conditions, resulting in greater tolerance to experimental warming and drought, and suggesting that urban evolution may drive establishment and spread of invasive species under climate change.

Session 3 – Global change and invasions

UPDATES ON ASCIDIAN DIVERSITY IN THE ARTIFICIAL HABITATS OF THE RED SEA AND THE ARABIAN GULF

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Ascidians represent a diverse group of marine invertebrate filter feeders within the phylum Chordata. Despite their important ecological roles, pharmacological potential, and use as model organisms for developmental and evolutionary studies, invasive species may threaten natural systems and the maritime socioeconomic value. This study aims to update the list of ascidian species in the artificial habitats of Saudi waters in the Red Sea and the Arabian Gulf, thereby contributing to the understanding of their distribution, ecological implications, and potential impacts on their unique ecosystems. In 2024, a monitoring programme of non-indigenous marine species (NIS) was initiated in Saudi Arabia. This programme targeted 34 sites, including marinas and harbours, across the Red Sea and the Arabian Gulf. A total of 170 settlement plates were deployed and revisited every three months. In the first retrieval, 544 voucher specimens of ascidians were collected for morphological and genetic analyses, providing a robust approach to species identification and classification. This study provides an updated list of ascidian species in these artificial habitats. The findings will enhance our understanding of the ecological dynamics in these regions and underscore the critical importance of identifying these species, particularly within artificial habitats, to understand ascidians biodiversity and detect potentially invasive species. These habitats often act as gateways for the introduction of NIS, emphasising the significance of this study for future conservation efforts. By identifying these species, we can mitigate potential impacts on biodiversity and the economy and safeguard nearby ecosystems, such as coral reef and seagrass beds.

Session 1 – Risk assessment and management of invasive species

NUTRITIONAL VALUE AND HEAVY METAL CONTAMINATION IN NATIVE AND NON-INDIGENOUS SOLITARY ASCIDIANS IN ITALIAN WATERS

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Ascidians are among the most abundant taxa in biofouling communities of ports and shellfish farming facilities and among the best-known invaders of these habitats. Their population outbreaks can generate large biomasses, with impacts on biodiversity and local economy. However, recent studies show that ascidians are potentially exploitable in various industrial applications. This study aims to investigate the nutritional characteristics and heavy metal content of three non-indigenous ascidian species present in the Lagoon of Venice (Italy), namely *Styela clava*, *Styela plicata* and *Ciona robusta*, to possibly consider their exploitation as a management option. Two native ascidian species (*Phallusia mammillata* and *Ascidiella aspersa*) were also included in the analysis for comparison. Specimens were sampled in July 2023 and preserved in a freezer until further processing. The proximate composition was determined following the procedure of the Association of Official Analytical Chemists, while the fatty acid profile was determined by gas chromatography-mass spectrometry. The mineral component, including presence of heavy metals and toxic elements, was evaluated by inductively coupled plasma-mass spectrometry after microwave digestion. All the five species exhibit an interesting nutritional profile; in particular, *C. robusta* and *P. mammillata* have a higher percentage content of polyunsaturated fatty acids, especially Omega-3, while *A. Aspersa* and *Styela* spp. show a higher content of saturated and monounsaturated fats. *C. robusta*, *P. mammillata*, *A. Aspersa* have higher heavy metal contamination values (i.e. V and Fe) than *Styela* spp. The findings suggest the feasibility of human consumption of the latter, already exploited in Korea and Japan. This can also represent a possible management option for these non-indigenous species. Native ascidians also exhibit potential for becoming a bioeconomic resource.

Session 4 – Socioeconomic impacts of invasions

FIRST RECORD OF THREE ALIEN TERMITE SPECIES (INSECTA: ISOPTERA) IN BELGIUM

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The presence of subterranean termites (family Rhinotermitidae) and drywood termites (family Kalotermitidae) poses significant challenges as potential pests, capable of causing substantial damage to wooden structures and leading to economic losses. Some species within these families exhibit high levels of destructiveness and have become invasive in numerous regions worldwide. Introductions or expansions of termite populations often result from the importation of infested wood, plants, or soils. Here, we document the initial occurrences of three exotic termite species in Belgium: *Cryptotermes brevis* and *Reticulitermes banyulensis* in Brussels (Brussels Capital Region), and *Reticulitermes flavipes* in Brugelette (Hainaut province; Walloon region). Morphological identification of specimens was corroborated through DNA-barcoding validation. While infestations of *Cryptotermes brevis* and *Reticulitermes banyulensis* are likely inconsequential due to unfavorable local climatic conditions, the establishment and spread of *Reticulitermes flavipes* in Belgium is more likely and will be monitored closely. These findings underscore the importance of vigilance and effective pest management strategies to mitigate potential impacts.

Session 3 – Global change and invasions

BOPCO: AN IDENTIFICATION SERVICE FOR SPECIES OF POLICY CONCERN, INCLUDING INVASIVE ALIEN SPECIES

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Invasive alien species (IAS) can cause a multitude of socio-economic and ecologic problems, warranting the need for their early detection, monitoring, and management. To do so, reliable species identifications are required, using morphology- and/or DNA-based approaches. BopCo is a Belgian centre of excellence that provides such identification services for various species of policy concern, including IAS. BopCo is jointly run by the Royal Belgian Institute of Natural Sciences and the Royal Museum for Central Africa, and has access to extensive reference collections, expert taxonomists, and a comprehensive research infrastructure. BopCo handles on-demand species identification requests and is a partner on various projects related to IAS. As such, BopCo contributes to studying the introduction pathways and dispersal dynamics of two invasive mosquito species in Belgium, *Aedes albopictus* and *Ae. japonicus*. Using various DNA identification techniques, BopCo verifies the species identity of the exotic mosquitoes collected at multiple points of entry. Furthermore, BopCo was involved in documenting the first occurrences of three exotic termite species in Belgium: *Cryptotermes brevis*, *Reticulitermes banyulensis*, and *R. flavipes*. Morphological identification of specimens was corroborated through DNA-barcoding validation. *Reticulitermes flavipes* is of particular concern as it has been invasive in France for many years and likely to establish populations in Belgium. Finally, BopCo evaluates the usefulness of publicly available DNA sequence data to identify the plant and animal species included in the list of "Invasive Alien Species of Union Concern" (EU Regulations 2016/1141 and 2017/1263). The results are presented as "IAS Factsheets" which aim to inform policy makers and provide relevant authorities with an identification tool for suspected IAS samples.

Session 6 – Pathways and dispersal of invasive species

THE SPREAD OF PUMPKINSEED (*LEPOMIS GIBBOSUS*) AND CHINESE SLEEPER (*PERCCOTTUS GLENII*) IN FINLAND – INTENTIONAL HUMAN RELEASE AS A LIKELY PATHWAY

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Two invasive alien fish species of European Union concern are currently present in Finnish nature, the pumpkinseed (*Lepomis gibbosus*) and the Chinese sleeper (*Perccottus glenii*). The pumpkinseed was first recorded in southwest Finland in 2014. In the last ten years, the known locations of the pumpkinseed have increased to 45; these locations are strongly concentrated in southwestern Finland. Typical locations for the pumpkinseed are small ponds, sand pits and quarries. The first record of the Chinese sleeper in Finland was in 2022. This population was successfully eradicated with rotenone treatment. Costs of the eradication measures were about 10,000 €. Since then, the Chinese sleeper has been found from another location. Both sites are small ponds in southwestern Finland. Information of invasive fish species occurrence in Finland relies on citizen science. Citizens can report their observations through an online platform and observations are verified by experts. Habitat type and location of the known sightings of both pumpkinseed and Chinese sleeper indicate that these species have probably arrived and spread by intentional human release. Numerous other invasive and probably intentionally released species, such as amphibians and aquatic plants, have also been found in southwestern Finland. National as well as EU legislation prohibit the spread and intentional release of invasive alien species. Concerns arise from the scenario of these invasive alien species spreading to river and lake systems, with potentially serious consequences to local biodiversity. More resources are needed for the systematic mapping of the distribution of these fish species, with the addition of eDNA methods. Eradication measures need to urgently target the most vulnerable locations. Additionally, continued outreach and education is needed to inform citizens of the serious threat to biodiversity posed by invasive species.

Session 5 – Conservation issues and biological invasions

THE EFFECTS OF ALIEN AQUATIC PLANTS ON FRESHWATER COMMUNITIES IN TUSCANY (ITALY)

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Freshwater ecosystems are threatened by the presence of alien macrophytes, which can considerably alter the invaded environments. The aim of the study was to evaluate the effects of three South American invasive alien species, *Myriophyllum aquaticum*, *Alternanthera philoxeroides* and *Ludwiglia peploides montevidensis*, on the composition and diversity of plant and animal communities in some freshwater systems in Tuscany. Between July and October 2023, two samplings were conducted in Lake Porta area and along the Arno river in Empoli and Florence in transects invaded by the above mentioned plants and in transects characterised by native vegetation. For each transect, the plant cover of the species was assessed and the animal community was sampled with a macroinvertebrate net. All the three macrophytes have an effect on plant and animal communities, although with differences related to species and environment. Specifically, *M. Aquaticum* causes a significant reduction in the diversity of plant communities, but not of animal communities. On the contrary *A. philoxeroides* seems to favor an increase of species for both plant and animal communities, also through a terrestrialization effect of the aquatic environment, observed even for L. peploides. Due to their dense mats, the three macrophytes can provide more shelters and substrates to other animal species, including highly invasive alien ones that can further alter the ecosystems, such as the red swamp crayfish *Procambarus clarkii* and the Asian mollusk *Sinotaia quadrata*. Proper management of these macrophytes are thus needed to protect the biodiversity of freshwater ecosystems.

Session 1 – Risk assessment and management of invasive species

ANALYSIS OF MANAGEMENT FEEDBACKS FROM THE FRENCH IAS RESOURCE CENTER : WHAT TRENDS IN CURRENT MANAGEMENT APPROACHES ?

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Face to biological invasions, one of the main expressed needs among the stakeholders is the availability of management methods and techniques. However, even if practical knowledge on the management of Invasive Alien Species (IAS) is abundant, it remains difficult to gather in a systematic way. To ensure that this knowledge does not remain untapped, the French IAS resource center has initiated a continuous call to compile project management reports, drafted collaboratively with the managers of each IAS project. Rather than offering universally applicable « solutions » that may not suit local context, these reports provide highly practical insights and propose actionable ideas for testing.
This approach, launched in 2012, has already produced nearly a hundred project management feedbacks. While it represents a small sample considering all the actions carried out in continental France, it is sufficient to identify some trends. In 2023 and 2024, an analysis of these reports was conducted to provide information such as the relative importance of the managed species, the techniques used, the objectives and their achievement, as well as difficulties on the field. For example, out of 94 management reports concerning 25 species of flora and 16 species of fauna, 159 protocols were identified, of which 68% aimed at population control and 32 % at eradication, with a success rate of 42,5%.
The aim of this study was also to give leads to improve the future reports by identifying new useful information to collect, like intervention costs ; data to be standardized for more precise analysis, (e.g., post-intervention survey); and prioritizing management reports to enrich the report diversity by choosing protocols about new invasive species, overseas territories and marine invasive species.

Session 3 – Global change and invasions

RESILIENCE OF MEDITERRANEAN MOUNTAINS: A CHARACTERIZATION AND DISTRIBUTION OF INVASIVE SPECIES IN THE IBERIAN PENINSULA.

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An important consequence of human activities at global scale is species' (un)intentional assisted migration, facilitating access of non-native species to new habitats. The establishment and naturalization of non-native species may negatively affect native species, altering the functioning of the ecosystems, potentially causing further damages, and biodiversity loss. Ecosystems located at the extremes of environmental gradients are among the few ecosystems in the world that have not yet been heavily invaded by non-native plants. However, studies based on the Mountain Invasion Research Network (MIREN) protocol show that non-native species are increasingly entering different altitudes and different parts of environmental gradients. Unfortunately, this has not been assessed in the Mediterranean basin and across both altitudinal and aridity gradients. We set 60 sites along three roads in Sierra Nevada (Granada, Spain), following both an altitudinal (700 to 3000 m.a.s.l.) and aridity gradient. In each site we surveyed three longitudinal plots of 50 m (one parallel to the road and two perpendicular to the first one) recording the abundance and cover of all plant species (native and non-native). We also characterized sites with climate, edaphic, topographic, and landscape information. Their association with alpha diversity and non-native plant occurrence was studied using Generalized Linear Models. We found relatively low invasion, with 20% of sites invaded, all located at low elevation. More interestingly, we observed significant differences in alpha biodiversity with plots at low altitudes and closer to roads showing both higher native diversity and invasion occurrence. Furthermore, native diversity was related to edaphic variables (i.e. pH and surface nitrogen) and landscape heterogeneity, and climatic variables (i.e. radiation). This work highlights the importance of anthropic effect in the establishment of invasive species and how this effect loses importance at intermediate and high altitudes and more arid ranges.

Session 1 – Risk assessment and management of invasive species

THE IMPACT OF *ROBINIA PSEUDOACACIA* L. ON FOREST NATURAL REGENERATION

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Robinia pseudoacacia L., due to its peculiar biology and ecology, including its nitrogen-fixing strategy, can effectively transform forest ecosystems, especially soil and light conditions. One of the crucial elements of forest sustainability is regeneration ability, conditioning the change of generation. Natural forest regeneration is gaining importance as an alternative to its artificial counterpart. We aimed to study the impact of R. pseudoacacia on natural forest regeneration along its quantitative gradient expressed by aboveground biomass. The scaled effect (per capita effect) of invasive tree species, including *R. pseudoacacia*, on spontaneous forest regeneration is insufficiently recognized. We established 96 plots in western Poland in managed forests with Scots pine *Pinus sylvestris* L. on nutrient-poor sites, and with oaks *Quercus robur* L./ *Quercus petraea* (Matt.) Liebl. on nutrient-rich sites. We hypothesize that *R. pseudoacacia* will impact natural forest regeneration along its biomass gradient and will promote the other invasive tree species, according to the invasional meltdown concept. Particular native tree species will react differently, negatively or positively, with varying intensities, depending on their habitat requirement and competition resistance. Our study is important in the context of invasive tree species management in natural regeneration promoting forests. Additionally, our study will contribute to a better understanding of the phenomenon of competition between invasive and native trees, as well as be helpful in *R. pseudoacacia* assimilation or eradication from native ecosystems. The study was financed by the National Science Centre, Poland, under project no. 2019/35/B/NZ8/01381 entitled "Impact of invasive tree species on ecosystem services: plant biodiversity, carbon and nitrogen cycling and climate regulation".

Session 5 – Conservation issues and biological invasions

OTTERS DON´T LIKE INVASIVE BLUE CRABS (WILL THEY?)

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Interactions between native predators and invasive prey are crucial in the integration of the invasive species into the food webs and, consequently, in determining invasion dynamics and impacts. The Atlantic blue crab (*Callinectes sapidus*) has recently invaded coasts, estuaries and rivers across Europe and Northern Africa, establishing abundant populations and becoming a potentially important trophic resource. In fact, the blue crab is consumed by a huge amount of predators in its native area. However, reports of predation upon invasive blue crabs are scarce and its role as prey has not been explicitly explored yet.
The Eurasian otter (*Lutra lutra*) is a flexible predator that often consumes invasive prey as they become available. We investigated the diet of the otter in a small estuary of southern Spain hosting a very abundant blue crab population to show that predation upon blue crabs by the otter was only anecdotal. Blue crab remains were found in just one out of 223 spraints (otter faeces) collected between 2021 and 2023. Otter diet was dominated by two other invasive species of North American origin, the red-swamp crayfish (*Procambarus clarkii*) and the mummihog (*Fundulus heteroclitus*).
The avoidance of the blue crab as prey was an unexpected result since in its native area this crab is frequently preyed upon by different otter species within the genus Lontra. Predation on invasive blue crabs may entail a long-lasting learning process to overcome the anti-predatory structures and behaviours of this agile and aggressive species. Trophic interactions between the invasive blue crab and native predators deserves attention for three main aspects: i) the implications for the functioning and structure of invaded food webs, ii) its potential role in limiting the invasion, and iii) the interest of the generation and diffusion of new predatory traits among animal populations.

Session 5 – Conservation issues and biological invasions

EXPLORING THE POTENTIAL IMPACTS OF THE ASIAN HORNET, *VESPA VELUTINA*, TO POLLINATING INSECTS

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Vespa velutina, Asian hornet, was first observed in France in 2005. This species was unintentionally introduced into France and has since spread rapidly within Europe. It is included within the list of invasive alien species of Union Concern (EU Regulation on Invasive Alien Species 1143/2014[1]). Between 2016-2022 there were 23 confirmed sightings of *V. velutina* in the UK, however this total had risen to 101 observations in 2023. *Vespa velutina* is well documented as a predator of the European Honeybee, *Apis mellifera*, which unlike the Asian honeybee, *Apis cerana*, has not developed effective defences to *V. velutina*. However, little is known about the impact of *V. velutina* on other species of insect within Europe, which include some important pollinators such as species of fly (Diptera). Understanding the impacts of invasive alien species, such as *V. velutina*, is critical to inform policy and guide management. V. velutina captures prey in flight and then lands to process the prey item, removing all body parts except the thorax which is chewed to form a prey pellet to feed to hornet larvae in the nest. Using a trait-based mixed effects model incorporating body size, seasonality, habitat and family of the prey species, I have assessed which species of Diptera could be most at risk if *V. velutina* established in the UK. I used data from published field studies in the Dordogne (France), which incorporated morphological and DNA barcoding techniques to quantify the frequency of prey species within the pellets of *V. velutina* (Rome et al., 2021). I used the outcomes from these studies on diet in the Dordogne within the models and ultimately to predict potential UK prey species. This work underpins my research on the robustness of plant-pollinator networks in the UK under varying invasion scenarios of *V. velutina*.

Session 5 – Conservation issues and biological invasions

INVASIVE HOSTS – INVASIVE PARASITES? THE DIVERSITY OF TRYPANOSOMATIDS IN INVASIVE TRUE BUGS (HEMIPTERA: HETEROPTERA)

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As a result of globalisation and climate change under way, we are witnesses to an ongoing surge of invasive species. Inevitably, invasive organisms introduce their parasites into newly colonized habitats, and conversely, interfere with the local parasitofauna. In this ongoing study, we investigated the diversity of insect parasites – trypanosomatids – in three economically important invasive bugs (*Leptoglossus occidentalis*, *Nezara viridula* and *Halyomorpha halys*) in Czechia. With the help of over 100 citizen scientists, we have collected more than 300 live specimens from more than fifty sites and examined them for the presence of trypanosomatids. So far, *Phytomonas serpens* and an undescribed species of *Obscuromonas* have been found in *L. occidentalis*, and an undescribed species of Phytomonas in *N. viridula*. Surprisingly, these three parasites, which have never been recorded in native European bugs before, were repeatedly found in the studied bugs from different localities, indicating their non-native origin. On the other hand, no native species of trypanosomatids were recorded in the invasive bugs so far. In the future course of this project, we aim to continue collecting data from citizen scientists, especially after the invasive bugs become established in natural or seminatural habitats and could be exposed to spillover infections from native trypanosomatids.

Session 6 – Pathways and dispersal of invasive species

CHARTING NEW WATERS: EXPLORING RED SEA MARINAS AS GATEWAYS FOR NON-INDIGENOUS BRYOZOANS IN THE MEDITERRANEAN SEA

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Bryozoans are successful colonizers of hard substrates, which allows them to overcome their natural dispersal barriers, mostly as stowaways on ship hulls, and be introduced to new areas. In particular, these organisms thrive in artificial structures of recreational marinas, which are considered key points for the introduction and spread of non-indigenous species (NIS). This is due to the abundant and diverse structures that they offer for species colonization, such as floating pontoons, ropes, boat hulls and breakwaters, and to their connection with other maritime traffic facilities (for example, commercial and fishing ports). This intricate network of substrates and facilities is especially relevant for the spread of bryozoan NIS in maritime traffic hotspots, such as the Red Sea, and across artificial waterways like Suez Canal, which has already served as a pathway for bryozoan introductions to the Mediterranean Sea. Therefore, a deep understanding of bryozoan diversity in marinas of the Red Sea is crucial to properly identify potentially invasive species and manage these potential introductions to other areas. Here, we characterized bryozoan diversity in artificial structures of ten marinas along the Saudi Arabian Red Sea shoreline using material from artificial substrates scrapings and settlement panels through a combined morphological and molecular approach. We provide a baseline of bryozoan species in marinas, highlighting potential NIS to the Red Sea and species that, while not yet detected in the Mediterranean Sea, have the potential to become NIS there in the future. We also provide key diagnostic characters and DNA sequences, which are helpful tools for the early detection and proper preventive management of these possible newcomers.

Session 6 – Pathways and dispersal of invasive species

OCCURRENCE AND ABUNDANCE OF THE NON-INDIGENOUS ALGA *RUGULOPTERYX OKAMURAE* ALONG THE ALENTEJO COAST (SW PORTUGAL): FIRST OBSERVATIONS

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This work summarizes the results of the first observations on the occurrence and abundance of *Rugulopteryx okamurae* along the rocky coastline of Alentejo region in Portugal. Morphological characteristics confirmed species taxonomic identification and molecular analyses are being conducted. Records of the presence or absence of *R. okamurae* and its abundance were compiled into a georeferenced database. These records were collected between January and July 2023, from the Cape of Sines to Azenha do Mar. Observations were made on rocky shores, in shallow intertidal and subtidal (up to 3 m and 25 m deep, chart datum) environments. The abundance of *R. okamurae* was assessed semi-quantitatively through active searches lasting 15 minutes or quantitatively through direct observations of 50x50 cm sampling quadrats or 10 x 2 m transects, or photographic records obtained in 20 x 20 cm quadrats followed by image analysis. The abundance of drifting algae in coastal seawater and washed ashore was also noted. *R. okamurae* exhibited widespread occurrence along the studied region. However, it was only observed with high abundance and firmly attached to rocky substrates in areas with lower hydrodynamics, such as Vale Marim and the Port of Sines, and was primarily observed at shallow depths (<10 m, chart datum). The occurrence and quick colonization of *R. okamurae* of this coast, particularly in rocky seabeds such as those in the Port of Sines, indicate its high invasive potential, as already observed in the Mediterranean Sea, southern Spain, the Algarve and the Azores. It is crucial to continue monitoring its presence and abundance along the Alentejo coast and implement mitigation measures to contain its spread.

Session 2 – New tools and approaches for detection and monitoring

NON-NATIVE SPECIES OF AQUATIC ANIMALS IN BELARUS: NEW RECORDS, EXPANSION AND REGULATION OF INVASIVE ALIEN SPECIES

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In recent decades, native aquatic species of Belarus are under the threat of alien invasive species that have intensified and accelerated through anthropogenic pressures and climate change. It was shown that the main passways for aquatic invertebrates' introduction in Belarusian rivers and lakes were unaided, transport-contaminant and transport-stowaway, whereas the main passway for fish introduction was intentional introduction for fishing purpose. Several non-native fish (brown bullhead) and invertebrates expanded their range. Amphipod *Dikerogammarus haemobaphes* (Eichwald, 1841) was first recorded in the Belarusian part of the Neman River basin (Augustów canal) in 2018 and later in 2021 in the Neman River itself. For the first time freshwater jellyfish *Craspedacusta sowerbii* Lankester, 1880 was detected by eDNA survey in several big rivers (Neman, Dnieper, Pripyat, Berezina) and after recorded in different closed reservoirs. The spread of aquatic alien species across the country occurs both through natural spreading and with the help of humans (intentional introduction to new habitats for further use, unintentional introduction using water transport and fishing gear, etc.). There are several cases, when spiny-cheek crayfish *Faxonius limosus* (Rafinesque, 1817) was recorded in the small ponds located far from the rivers, where non-native crayfish established. Such cases of species spread are often associated with inaccurate identification of non-native species, insufficient awareness about the problem of biological invasions, and their impact on native species. After the acceptance of the Concept of the National Biosafety system in Belarus in 2022, in which alien animals and plants are identified as the main objects within the framework of the implementation of the strategic direction «Control of invasive species», was shown that existing regulation does not fully control introduction and spread of invasive alien species, and is also insufficient to monitor the current situation, assess their impacts to natural ecosystems, native species and the economy.

Session 1 – Risk assessment and management of invasive species

ASSESSING THE ECOLOGICAL IMPACTS OF INVASIVE ALIEN PLANTS OF FRANCE USING ADAPTED PROTOCOLS OF EICAT AND EICAT+

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The creation of prioritized checklists ranking alien taxa depending on their risk for biodiversity is an essential step for an effective management of invasive alien species (IAS). In France, such lists for alien plants are drawn up by different structures at regional and national scales using various risk assessment methods. This lack of homogenization in assessment methods limits the implementation of the French national strategy on IAS. To address this problem, we investigated if two recent frameworks, EICAT and EICAT+, have the potential to become standards for assessing the ecological impacts of alien plants in France. We first identified the needs and constraints associated with the use of these two protocols, and proposed several modifications. We then assessed with the modified EICAT/EICAT+ (i) the regional impacts of 100 alien plants naturalized in a French region, and (ii) the national impacts of the 230 plants identified as invasive in mainland France. Modifying EICAT and EICAT+ is tricky, as too many changes would compromise the standardization feature of these methods and limit comparison with assessments from other territories. Firstly, we propose criteria to better define some concepts (e.g., local population), which were difficult to handle with plants in a continental context. Secondly, sourced impact data are required in both methods, but are either non-existent or fragmentary for most species at a regional scale, leading to a high number of "data deficient" species. Therefore, we include local knowledge from botanists and wildlife specialists, in addition to literature review. Finally, we propose a key for translating field observations into impact levels, because local knowledge is usually related to species behaviour and often cannot be translated into EICAT(+) impact. This work provides the most comprehensive assessment to date of the current ecological impacts in France of 280 alien plants on a local and/or national scale.

Session 3 – Global change and invasions

AN INVASIVE SPECIES ACTING AS AN ECOLOGICAL TRAP FOR A TOP FRESHWATER PREDATOR

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Over time, the use of plastic has become essential to humanity due to its predominant characteristics such as versatility and durability, contributing significantly to its accumulation in aquatic ecosystems. When present in ecosystems, plastic degrades into microplastics, particles less than 5 mm in size, facilitating its ingestion by organisms and posing a potential high risk to them. In Portugal, the invasive signal crayfish (*Pacifastacus leniusculus*) may constitute more than 50% of the European otter's (*Lutra lutra*) diet in areas where both species live in sympatry. This study aims to determine if the signal crayfish increases microplastic exposure for the European otter, a freshwater top predator, and if this invasive species can function as an ecological trap. We also examined if the amount and type of macroplastics along the banks of four rivers (Rabaçal, Tuela, Mente, and Baceiro) in Montesinho Natural Park, Northeast Portugal, correlate with microplastics found in these animals, helping identify primary pollutant sources in freshwater environments. The otter feces (n=30), sampled in invaded and non-invaded areas, were processed to extract microplastics using hydrogen peroxide (30%), potassium hydroxide (10%) and sodium chloride. The crayfish (n=2) gills and gastrointestinal tract were treated with hydrogen peroxide (30%) to extract microplastics. Finally, all suspected particles were measured using FT-IR and Raman spectroscopy techniques to identify the number and types of plastics present. Preliminary results indicate higher macroplastic presence, mainly blue and black, in the Tuela and Rabaçal Rivers (34% and 32% respectively). Otter feces analysis revealed more microplastics in invaded areas, with greater color diversity. The crayfish gills showed more microplastics in a higher diversity of colors than the gastrointestinal tract. In conclusion, it seems possible that the invasive signal crayfish is increasing the microplastic exposure in otters, functioning as a possible ecological trap for this top predator.

Session 2 – New tools and approaches for detection and monitoring

A HORIZON SCAN OF EMERGING TECHNOLOGIES FOR ALIEN SPECIES CITIZEN SCIENCE

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Citizen Science (CS) significantly contributes to the study and management of biological invasions. Technological developments such as social media, internet scraping, eDNA, apps, sensors, search engines and predictive analytics can foster projects and increase the reach of CS. The list of tech is long and their potential for alien species CS is unclear. To help research funders and project initiators we performed a horizon scan on the value of emerging technologies for alien species CS.

A network of 44 experts from the COST Action Alien-CSI identified and assessed 39 technologies. Assessors rated their usefulness on a 5-point Likert scale with respect to their potential to attract new audiences, improve inclusivity, applicability in daily life, ability to increase engagement, provide feedback, improve data quality and gather new data.

The results of the scoring were discussed at a consensus workshop. Consistency among ratings was explored using inter-rater reliability metrics and ordination techniques. Experts were asked to explain and discuss the reasons for inconsistent rating across technologies or criteria, focusing on the evidence used or differences in interpretation of criteria. After this, one new round of individual re-evaluation of technologies followed. The discussions resulted in increased consensus on the potential of the different technologies.

Mobile-based data collection platforms and social media (both their use to interact with CS participants as well as their potential for scraping new occurrence records) were the top-ranking technologies for IAS CS, followed by machine learning techniques, the application of AI and collective intelligence. Technologies differed considerably in their potential when different criteria were individually considered. For instance, DNA-based technologies ranked high on acquiring new data, open data technologies scored high on their potential to improve the quality of collected data. Virtual reality and gamification scored high on their potential to increase engagement in IAS CS.

Session 1 – Risk assessment and management of invasive species

INVASIVE ALIEN SPECIES OF UNION CONCERN IN THE CZECH REPUBLIC: EARLY WARNING SYSTEM AND RAPID CONTROL

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The Union list currently comprises 88 invasive alien species (IAS), with 21 of them occurring in the Czech Republic. Under Regulation EU No. 1143/2014, Article 16, member states are obliged to implement an early warning system for new findings of IAS and undertake rapid eradication or isolation responses to prevent further spread. This paper focuses on three IAS recently recorded in the Czech Republic. The marbled crayfish (*Procambarus virginalis*) was discovered in spring 2016 in an urban pond in Prague (eradicated), in summer 2016 in an artificial pond in a spoil heap near the Bílina River (under monitoring, using predatory fish for population reduction), and in 2020 in a small pond in Prague. Various eradication methods (draining, liming, releasing predatory fish) were employed, and this location continues to be monitored. The Asian hornet (*Vespa velutina*) was first recorded in Plzeň city in October 2023. The nest was located, carefully removed, studied, and deposited in a scientific museum. Other sightings of hornet specimens were reported near Prague (October 2023) and Rokycany (February 2024), but the nests were not found. Since the end of 2023, active cooperation with beekeepers and firefighters has been established, along with the implementation of an early warning system and public involvement. All prevention and eradication activities are detailed in the updated eradication plan as of April 2024. Parrot's feather (*Myriophyllum aquaticum*) was discovered in a flooded quarry near Kolín. Releasing herbivorous fish (Grass carp) and mechanically removing plant biomass were determined as the most effective management methods. Efficient eradication or isolation of IAS, particularly those first recorded in the Czech Republic, requires not only cooperation between policymakers, scientists, and stakeholders but also the participation of the general public in citizen science. Public education and communication are key approaches in combating IAS.

Session 5 – Conservation issues and biological invasions

BEHAVIORAL COMPETITION BETWEEN *P. PAPILLOSA* (LESSON, 1830), A POTENTIAL INVASIVE SPECIES, AND NATIVE INTERTIDAL SEA ANEMONE SPECIES

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Invasive species have globally altered marine habitats and are the second biggest cause of species extinction, making it essential to analyze their presence and predict the damage they may cause. *Phymactis papillosa* (Lesson, 1830), native to the Pacific coast of South and Central America, is a species of sea anemone, exotic in Portugal, with its first record in this location in 2017. As this species is confined to the rocky intertidal, it can impact native species by space competition, especially with the ones from the same functional group. To test this hypothesis, aggressive interactions between *P. papillosa* and the most abundant rocky intertidal sea anemone species were recorded and analysed. Green and red morphotypes of *P. papillosa* were used to assess possible differences between them. Nine agonistic behaviors were observed, with the exotic species being dominant over the species of the genus Actinia but equivalent to *A. viridis,* both in terms of the results of confrontations and aggressiveness. There were no clear differences between the two morphotypes of *P. papillosa*. The application of acrorhagi, an important structure in the aggressiveness in anemones, was less frequent than expected. These results show that *P. papillosa* can have negative impacts on Actinia species, due to its behavioural dominance, with impact on the native species spatial distribution.

Session 6 – Pathways and dispersal of invasive species

THE EFFECT OF LAST GLACIATION MAXIMUM RANGE RESTRICT ALSO NEOPHYTES RICHNESS IN CENTRAL EUROPE

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The effect of the Last Glaciation Maximum (LGM) climate is known to still influence the contemporary pattern of plant species richness in Europe, however, it seems unlikely that it correlates with neophyte richness, due to the recentness of the biological invasions phenomenon. Nonetheless, the effect of glaciation was not only restricted to past climate modification but also to creation of specific land relief and soil substrate and also was spatially congruent with the thermal gradient of contemporary climate, from south to north. Here, we compared spatial patterns of native species richness with neophytes and modeled the effect of their potential drivers in Poland, Central Europe. By joining and harmonizing two independent databases we obtain a new, comprehensive data set, which allows us to map the richness of neophytes in a 10x10 km grid at a spatial extent of the entire country (ca 312,000 km^2, divided into 3,283 10x10 km squares). Species richness spatial patterns of both groups correlate with the LGM range. We showed also that neophyte richness correlates generally with native species richness, jeopardizing numerous national-scale biodiversity hotspots. Such a correlation between native and neophyte richness results from post-glacial patterns of human settlements in this part of Central Europe: typically more productive areas, on specific geological substrates and diverse landscape, which can support high species richness were more eagerly settled by humans, and the human footprint intensity correlates, in turn, with neophytes richness. However, the environmental correlates of neophyte richness are not the same as native species: while native richness can be explained solely by environmental conditions (e.g. climate, land relief, soil properties) and the glaciation range, the employing socio-economics factors significantly improve the performance of models for neophyte richness.

Session 1 – Risk assessment and management of invasive species

EVALUATION OF EFFECTS OF PRE- AND POST-MANAGEMENT OF *ARUNDO DONAX* ON NATIVE VEGETATION IN A MEDITERRANEAN ISLAND

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Arundo donax L. negatively affects the conservation status of habitats under the EU Habitats Directive in the Mediterranean biogeographic region. However, being an archaeophyte that invaded since ages very large areas with dominant monospecific stands, e.g. in temporary rivers, it is somewhat difficult to evaluate impacts and to assess which type of native plant communities have been displaced. The main aim of this research is to investigate the effects of management actions such as local eradication of *A. donax* to promote the recovery of native vegetation in the island of Elba by evaluating the ecological impacts on plant communities focusing on black alder (*Alnus glutinosa*) riparian woods included in the Habitat 91E0*. The study is being carried out at Fosso di Pomonte, located on the island of Elba, the third largest Italian island and the first in the Tuscan Archipelago National Park, with a surface area of approximately 223.5 km^2. To analyze the impact of *A. donax*, a floristic survey will be carried out in the riparian vegetation. We will compare species richness in invaded and non-invaded plots before and after management actions. For each species, the percentage cover will be estimated visually, subdividing the entire plot into 4 subplots of 1 x 1 m. Furthermore, a management actions project led by NEMO S.r.l. will be based on frequent cutting of *A. donax* stems and this technique will be monitored in the long term to evaluate its success, based on the recolonization by native species and the recovery of the ecosystem. The expected outcome of this management approach is to obtain riparian areas that are no longer vulnerable to erosion or reinvasion by non-native invasive species.

Session 5 – Conservation issues and biological invasions

COTONEASTER SPECIES FROM THE SERIES BULLATI – A NEW ALLOCHTHONOUS SHRUB FOR THE FLORA OF SERBIA AND THE BALKAN PENINSULA

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Non-native species, especially invasive ones, are a constant threat to native flora. They are becoming increasingly prevalent in new areas due to rapid urbanization, trade, tourism, agriculture and climate change. The patterns of their distribution and abundance have not been sufficiently studied in the mountainous areas of Serbia and the Balkan Peninsula.
During a floristic surveys of the Zlatibor Nature Park (Western Serbia) in the period 2020–2023, the population of Cotoneaster from the series Bullati was discovered in the wider vicinity of the locality Partizanske vode, in the forest community of Pinus nigra and P. sylvestris right next to the highway. This is a new allochthonous taxon for the flora of Serbia and the Balkan Peninsula. The native ranges of the taxa from this group are restricted to Southwestern China. Detailed data on the distribution, morphology, ecology, habitat preferences and population size of the newly-recorded Cotoneaster taxon are presented. The population is most likely of sub spontaneous origin, counting c. 30 individuals, with a significant degree of cover in the shrub layer. Given the fact that the taxon has penetrated far into the pine forest, it is feared that the species could spread into the surrounding natural pine forest habitats as well.
Keywords: Cotoneaster, potential spread, non-native mountain species, Serbia.
Acknowledgements: The research was supported by the Science Fund of the Republic of Serbia, grant number 7750112 "Balkan biodiversity across spatial and temporal scales – patterns and mechanisms driving vascular plant diversity (BalkBioDrivers)", and the State Enterprise for Forest Management "Srbijašume", Forest Estate "Užice" – Protected plants monitoring project.

Session 5 – Conservation issues and biological invasions

FACTORS INFLUENCING THE DISTRIBUTION AND ABUNDANCE OF NON-NATIVE AND INVASIVE PLANT SPECIES IN THE MOUNTAINOUS AREAS: A CASE STUDY FROM MT. ZLATIBOR (SERBIA)

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The distribution of non-native and invasive plant species in the mountainous areas of the Central Balkans has not been sufficiently explored. The aim of this study was to determine the overall species richness, the number of occurrences and the main factors influencing the distribution and abundance of these species on Mount Zlatibor (Western Serbia). This area is known as a large serpentine massif and an important tourist centre in Serbia. Distance-Based Redundancy Analysis (db-RDA) was used to explore the influence of environmental factors on the distribution and abundance patterns of 18 non-native plant species, including some with invasive status. Data concerning geographical coordinates, altitude, habitat type, bedrock type, climatic factors, light regime, soil moisture, acidity, nitrogen and temperature of the habitats were used as explanatory variables. Habitat types, temperature and precipitation were found to be the factors most effectively affecting the distribution and abundance of the studied species. *Reynoutria x bohemica*, *Erigeron annuus*, *Robinia pseudoacacia*, *Amaranthus retroflexus* and *Galinsoga parviflora* occurred most frequently and had the highest abundances. This study highlights the predominant role of habitat types in partitioning the ecological niches of non-native plant species. The results provide a useful basis for the successful design of strategies to protect native habitats from invasion by non-native plants and for planning the control and removal of invasive species.
Keywords: allochthonous plant species, ecology, Balkan Peninsula, environmental factors, habitat types

Session – Risk assessment and management of invasive species

ANTI-HAIL NETTING IN VINEYARDS: A PROTECTION SYSTEM AGAINST *VESPA VELUTINA* THAT MAY NOT SUIT ALL CASES

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Vespa velutina is an invasive species of high concern whose adults feed on sugary substances, which may include flower nectar or tree sap, but also commercial fruits. Vineyards are known to be affected by this species, which bite the grapes, and different protection elements are being tested for reducing crop losses. In this work we evaluated the use of anti-hail nets in a historical wine-producing area in NW Spain (Betanzos, A Coruña), where traditional small-sized vineyards are especially prone to *V. velutina* attacks because of the high number of nests in the area. A factorial design experiment was performed by using groups of netted and unnetted vines of two white wine cultivars with the aim of: 1) assessing the effectiveness of netting on preventing grape yield loss, 2) assessing the impact of netting on the ripening process of grapes and bunch fungal infection, and 3) studying the potential relationship between the damage caused by *V. velutina* and grape fungal diseases. Results show that anti-hail nets protect grapes effectively both against hornets and birds. No significant correlation between the damage caused by *V. velutina* and the incidence of bunch fungal diseases was found in either cultivar. However, netting increased slightly the final sugar content in one of the cultivars, as well as the incidence of bunch fungal damage. Thus, potential drawbacks might outweigh the advantages of netting, as 1) netting might alter the ripening process of grapes and the incidence of bunch fungal diseases in some cultivars, 2) wine producers must make economic investments with high uncertainties on their potential return, and 3) netting would increase workload and management difficulties. Because of these limitations, netting might be an adequate protection method for areas especially affected by hornets, but not for all vineyards.

Session 3 – Global change and invasions

POTENTIAL CONTRIBUTION OF THE QUAGGA MUSSEL TO REMOVE ORGANIC POLLUTANTS FROM LAKE WATER

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Filter feeders, like mussels, could have a high potency to eliminate harmful substances from the environment. In the present study, we examined the distribution of organic pollutants in Lake Balaton, the largest shallow lake of Central Europe, and studied the sensitivity of the invasive quagga mussel to these substances and its potential to eliminate them from the water column. We found that in the lake threatened by tourism and urbanization, organic pollutants were below the level that could be harmful to mussels. However, at certain sites, and in the case of some pollutants (e.g. diclofenac), we detected some hints of episodic environmental burden imposed by these substances, as indicated by the stress gene activity pattern of the mussels. Elimination capacity of the mussels for polycyclic aromatic hydrocarbons (PAH) reached the maximum after four days of exposure to 5-10% diluted water accommodated fraction of fuel-oil fraction #4 when the mussels (20 ind./L) reduced the PAH level by 45-50%. Mussels (50 ind./L) removed 28% and 21% of ibuprofen and ketoprofen, respectively, from 1 µg/L concentrated solutions within 24 h. Many of the stress response genes were activated in the quagga mussel after their exposure to PAH. Results suggest a significant role of gregarious invasive bivalves in the removal of organic pollutants from lake water. The research was supported by the National Multidisciplinary Laboratory for Climate Change (RRF-2.3.1-21-2022-00014), and the Sustainable Development and Technologies National Program of the Hungarian Academy of Sciences (NP2022-II-3/2022).

CONFERENCE PARTICIPANTS

THE NEOBIOTA ASSOCIATION

NEOBIOTA is an international scientific organization dedicated to the study of biological invasions. It promotes collaboration among researchers, policymakers, and practitioners to understand and mitigate the impacts of invasive species on biodiversity, ecosystems, and human well-being.

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